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COLBURN'S FIRST LESSONS.

INTELLECTUAL
ARITHMETIC,
UPON THE
INDUCTIVE METHOD
OF
Instruction.

BY WARREN COLBURN, A. M.

STEREOTYPED AT THE BOSTON TYPE AND STEREOTYPE FOUNDRY
LATE T. H. CARTER & CO.

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1828.

DISTRICT OF MASSACHUSETTS, TO WIT:

District Clerk's Office.

BE it remembered, that on the Twenty-third day of March, A. D 1826, in the fiftieth Year of the Independence of the United States of America, *Cummings, Hilliard, and Company,* of the said District, have deposited in this office the Title of a Book, the right whereof they claim as Proprietors, in the words following, to wit:

"Intellectual Arithmetick, upon the Inductive Method of Instruction. By Warren Colburn, A. M."

In conformity to the Act of the Congress of the United States, entitled, "An Act for the encouragement of Learning, by securing the copies of maps, charts, and books, to the authors and proprietors of such copies during the times therein mentioned:" and also to an Act entitled, "An Act supplementary to an Act, entitled, An Act for the encouragement of learning, by securing the copies of maps, charts, and books, to the authors and proprietors of such copies during the times therein mentioned; and extending the benefits thereof to the arts of Designing, Engraving, and Etching Historical, and other prints."

JOHN W. DAVIS, Clerk of the District of Massachusetts

RECOMMENDATIONS.

Sir, Boston, 15 November, 1821.

I have made use of the Arithmetic and Tables, which you sometime since prepared, on the system of Pestalozzi; and have been much gratified, with the improved edition of it, which you have shown me. I am satisfied from experiment, that it is the most effectual and interesting mode of teaching the science of numbers with which I am acquainted.

Respectfully,
your obedient servant,
HENRY COLMAN.

Mr. Warren Colburn.

* * *

Having been made acquainted with Mr. Colburn's treatise on Arithmetic, and having attended an examination of his scholars who had been taught according to this system, I am well satisfied that it is the most easy, simple, and natural way of introducing young persons to the first principles in the science of numbers. The method here proposed is the fruit of much study and reflection. The author has had considerable experience as a teacher, added to a strong interest in the subject, and a thorough knowledge not only of this but of many of the higher branches of mathematics. This little work is therefore earnestly recommended to the notice of those who are employed in this branch of early instruction, with the belief that it only requires a fair trial in order to be fully approved and adopted.

J. FARRAR,
Prof. Math. Harvard University.

Cambridge, Nov. 16, 1821.

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PREFACE.

As soon as a child begins to use his senses, nature continually presents to his eyes a variety of objects; and one of the first properties which he discovers, is the relation of number. He intuitively fixes upon *unity* as a measure, and from this he forms the idea of more and less; which is the idea of quantity.

The names of a few of the first numbers are usually learned very early; and children frequently learn to count as far as a hundred before they learn their letters.

As soon as children have the idea of more and less, and the names of a few of the first numbers, they are able to make small calculations. And this we see them do every day about their playthings, and about the little affairs which they are called upon to attend to. The idea of more and less implies addition; hence they will often perform these operations without any previous instruction. If, for example, one child has three apples, and another five, they will readily tell how many they both have; and how many one has more than the other. If a child be requested to bring three apples for each person in the room, he will calculate very readily how many to bring, if the number does not exceed those he has learnt. Again, if a child be requested to divide a number of apples among a certain number of persons, he will contrive a way to do it, and will tell how many each must have. The method which children take to do these things, though always correct, is not always the most expeditious.

The fondness which children usually manifest for these exercises, and the facility with which they perform them, seem to indicate that the science of numbers, to a certain extent, should be among the first lessons taught to them.*

To succeed in this, however, it is necessary rather to furnish occasions for them to exercise their own skill in performing examples, than to give them rules. They should be allowed to pursue their own method first, and then they should be made to observe and explain it, and if it was not

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* See on this subject two essays, entitled *Juvenile Studies*, in the Prize Book of the Latin school, Nos. I and II. Published by Cummings & Hilliard, 1820 and 1821.

the best, some improvement should be suggested. By following this mode, and making the examples gradually increase in difficulty; experience proves, that, at an early age, children may be taught a great variety of the most useful combinations of numbers.

Few exercises strengthen and mature the mind so much as arithmetical calculations, if the examples are made sufficiently simple to be understood by the pupil; because a regular, though simple process of reasoning is requisite to perform them, and the results are attended with certainty.

The idea of number is first acquired by observing sensible objects. Having observed that this quality is common to all things with which we are acquainted, we obtain an abstract idea of number. We first make calculations about sensible objects; and we soon observe, that the same calculations will apply to things very dissimilar; and finally, that they may be made without reference to any particular things. Hence from particulars, we establish general principles, which serve as the basis of our reasonings, and enable us to proceed step by step, from the most simple to the more complex operations. It appears, therefore, that mathematical reasoning proceeds as much upon the principle of analytic induction, as that of any other science.

Examples of any kind upon abstract numbers, are of very little use, until the learner has discovered the principle from practical examples. They are more difficult in themselves, for the learner does not see their use; and therefore does not so readily understand the question. But questions of a practical kind, if judiciously chosen, show at once what the combination is, and what is to be effected by it. Hence the pupil will much more readily discover the means by which the result is to be obtained. The mind is also greatly assisted in the operations by reference to sensible objects. When the pupil learns a new combination by means of abstract examples, it very seldom happens that he understands practical examples more easily for it, because he does not discover the connexion, until he has performed several practical examples and begins to generalize them.

After the pupil comprehends an operation, abstract examples are useful, to exercise him, and make him familiar with it. And they serve better to fix the principle, because they teach the learner to generalize.

From the above observations, and from his own experience, the author has been induced to publish this treatise; in which he has pursued the following plan, which seemed to him the most agreeable to the natural progress of the mind.

GENERAL VIEW OF THE PLAN.

Every combination commences with practical examples Care has been taken to select such as will aptly illustrate the combination, and assist the imagination of the pupil in performing it. In most instances, immediately after the practical, abstract examples are placed, containing the same numbers and the same operations, that the pupil may the more easily observe the connexion. The instructer should be careful to make the pupil observe the connexion. After these are a few abstract examples, and then practical questions again.

The numbers are small, and the questions so simple, that almost any child of five or six years old is capable of understanding more than half the book, and those of seven or eight years old can understand the whole of it.

The examples are to be performed in the mind, or by means of sensible objects, such as beans, nuts, &c. or by means of the plate at the end of the book. The pupil should first perform the examples in his own way, and then be made to observe and tell how he did them, and why he did them so.*

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* It is remarkable, that a child, although he is able to perform a variety of examples which involve addition, subtraction, multiplication, and division, recognises no operation but addition. Indeed, if we analyze these operations when we perform them in our minds, we shall find that they all reduce themselves to addition. They are only different ways of applying the same principle. And it is only when we use an artificial method of performing them, that they take a different form.

If the following questions were proposed to a child, his answers would be, in substance, like those annexed to the questions. How much is five less than eight? Ans. Three. Why? because five and three are eight. What is the difference between five and eight? Ans. Three. Why? because five and three are eight. If you divide eight into two parts, such that one of the parts may be five, what will the other be? Ans. Three. Why? because five and three are eight.

How much must you give for four apples at two cents apiece? Ans. Eight cents. Why? because two and two are four, and two are six, and two are eight.

How many apples, at two cents apiece, can you buy for eight cents? Ans. Four. Why? because two and two are four, and two are six, and two are eight.

We shall be further convinced of this if we observe that the same table serves for addition and subtraction; and another table which is

The use of the plates is explained in the Key at the end of the book. Several examples in each section are performed in the Key, to show the method of solving them. No answers are given in the book, except where it is necessary to explain something to the pupil. Most of the explanations are given in the Key; because pupils generally will not understand any explanation given in a book, especially at so early an age. The instructer must, therefore, give the explanation *viva voce.* These, however, will occupy the instructer but a very short time.

The first section contains addition and subtraction, the second multiplication. The third section contains division. In this section the pupil learns the first principles of fractions and the terms which are applied to them. This is done by making him observe that one is the half of two, the third of three the fourth of four, &c. and that two is two thirds of three, two fourths of four, two fifths of five, &c.

The fourth section commences with multiplication. In this the pupil is taught to repeat a number a certain number of times, and a part of another time. In the second part of this section the pupil is taught to change a certain number of twos into threes, threes into fours, &c.

In the fifth section the pupil is taught to find $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, &c. and $\frac{2}{3}$, $\frac{3}{4}$, $\frac{4}{5}$, &c. of numbers, which are exactly divisible into these parts. This is only an extension of the principle of fractions, which is contained in the third section.

In the sixth section the pupil learns to tell of what number any number, as 2, 3, 4, &c. is one half, one third, one fourth, &c.; and also, knowing $\frac{2}{3}$, $\frac{3}{4}$, $\frac{2}{5}$, &c. of a number, to find that number.

These combinations contain all the most common and most useful operations of vulgar fractions. But being applied only to numbers which are exactly divisible into these fractional parts, the pupil will observe no principles but multiplication and division, unless he is told of it. In fact, fractions contain no other principle. The examples are so arranged, that almost any child of six or seven years old will readily comprehend them. And the questions are asked in such a manner, that, if the instructer pursues the method explained in the Key, it will be almost impossible for the pupil to perform any example without understanding the reason of it. Indeed, in

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formed by *addition,* serves both for multiplication and division. In this treatise the same plate serves for the four operations.

This remark shows the necessity of making the pupil attend to his manner of performing the examples and of explaining to him the difference between them.

every example which he performs, he is obliged to go through a complete demonstration of the principle by which he does it; and at the same time he does it in the simplest way possible. These observations apply to the remaining part of the book.

These principles are sufficient to enable the pupil to perform almost all kinds of examples that ever occur. He will not, however, be able to solve questions in which it is necessary to take fractional parts of unity, though the principles are the same.

After section sixth, there is a collection of miscellaneous examples, in which are contained almost all the kinds that usually occur. There are none, however, which the principles explained are not sufficient to solve.

In section eight and the following, fractions of unity are explained, and, it is believed, so simply as to be intelligible to most pupils of seven or eight years of age. The operations do not differ materially from those in the preceding sections. There are some operations, however, peculiar to fractions. The two last plates are used to illustrate fractions.

When the pupil is made familiar with all the principles contained in this book, he will be able to perform all examples, in which the numbers are so small, that the operations may be performed in the mind. Afterwards he has only to learn the application of figures to these operations, and his knowledge of arithmetic will be complete.

The Rule of Three, and all the other rules which are usually contained in our arithmetics, will be found useless. The examples under these rules will be performed upon general principles with much greater facility, and with a greater degree of certainty.

The following are some of the principal difficulties which a child has to encounter in learning arithmetic, in the usual way, and which are seldom overcome. First, the examples are so large, that the pupil can form no conception of the numbers themselves; therefore it is impossible for him to comprehend the reasoning upon them. Secondly, the first examples are usually abstract numbers. This increases the difficulty very much, for even if the numbers were so small, that the pupil could comprehend them, he would discover but very little connexion between them, and practical examples. Abstract numbers, and the operations upon them, must be learned from practical examples; there is no such thing as deriving practical examples from those which are abstract, unless the abstract have been first derived from those which are practical. Thirdly, the numbers are expressed by figures, which, if they were used only as a contracted way of writing numbers, would be much more difficult to be understood at first, than the numbers written at length in words. But they are not used merely as words, they require operations peculiar to themselves. They are, in fact, a new language, which the pupil has to learn. The pupil, therefore, when he commences arithmetic is presented with a set of *abstract* numbers, written with *figures*, and so large that he has not the least conception of them even when expressed in *words*. From these he is expected to learn what the figures signify, and what is meant by addition, subtraction, multiplication, and division; and at the same time how to perform these operations with figures. The consequence is, that he learns only one of all these things, and that is, how to perform these operations on figures. He can perhaps translate the figures into words, but this is useless since he does not understand the words themselves. Of the effect produced by the four fundamental operations he has not the least conception.

After the abstract examples a few practical examples are usually given, but these again are so large that the pupil cannot reason upon them, and consequently he could not tell whether he must add, subtract, multiply, or divide, even if he had an adequate idea of what these operations are.

The common method, therefore, entirely reverses the natural process; for the pupil is expected to learn general principles, before he has obtained the particular ideas of which they are composed.

The usual mode of proceeding is as follows. The pupil learns a rule, which, to the man that made it, was a general principle; but with respect to *him*, and often times to the instructer himself, it is so far from it, that it hardly deserves to be called even a mechanical principle. He performs the examples, and makes the answers agree with those in the book, and so presumes they are right. He is soon able to do this with considerable facility, and is then supposed to be master of the rule. He is next to apply his rule to practical examples, but if he did not find the examples under the rule, he would never so much as mistrust they belonged to it. But finding them there, he applies his rule to them, and obtains the answers, which are in the book, and this satisfies him that they are right. In this manner he proceeds from rule to rule through the book.

When an example is proposed to him, which is not in the book, his sagacity is exercised, not in discovering the operations necessary to solve it; but in comparing it with the examples which he has performed before, and endeavouring to discover some analogy between it and them, either in the sound, or in something else. If he is fortunate enough to discover any such analogy, he finds what rule to apply, and if he has not been deceived in tracing the analogy, he will probably solve the question. His knowledge of the principles of his rules, is so imperfect, that he would never discover to which of them the example belongs if he did not trace it by some analogy, to the examples which he had found under it.

These observations do not apply equally to all; for some will find the right course themselves, whatever obstacles be thrown in their way. But they apply to the greater part; and it is probable that there are very few who have not experienced more or less inconvenience from this mode of proceeding. Almost all, who have ever fully understood arithmetic, have been obliged to learn it over again in their own way. And it is not too bold an assertion to say, that no man ever actually learned mathematics in any other method, than by analytic induction; that is, by learning the principles by the examples he performs; and not by learning principles first, and then discovering by them how the examples are to be performed.

In forming and arranging the several combinations the author has received considerable assistance from the system of Pestalozzi. He has not however had an opportunity of seeing Pestalozzi's own work on this subject, but only a brief outline of it by another. The plates also are from Pestalozzi. In selecting and arranging the examples to illustrate these combinations, and in the manner of solving questions generally, he has received no assistance from Pestalozzi.

THE BOY WITHOUT A GENIUS.

Mr. Wiseman, the schoolmaster, at the end of his summer vacation, received a new scholar with the following letter:

Sir,—This will be delivered to you by my son Samuel, whom I beg leave to commit to your care, hoping that by your well-known skill and attention you will be able to make something of him; which, I am sorry to say, none of his masters have hitherto done. He is now eleven, and yet can do nothing but read his mother tongue, and that but indifferently. We sent him at seven to a grammar school in our neighbourhood; but his master soon found that his genius was not turned to learning languages. He was then put to writing, but he set about it so awkwardly that he made nothing of it. He was tried at accounts, but it appeared that he had no genius for that either. He could do nothing in geography for want of memory. In short, if he has any genius at all, it does not yet show itself. But I trust to your experience in cases of this nature to discover what he is fit for, and to instruct him accordingly. I beg to be favoured shortly with your opinion about him, and remain, sir,

Your most obedient servant,
HUMPHREY ACRES.

When Mr. Wiseman had read this letter he shook his head, and said to his assistant, a pretty subject they have sent us here! a lad that has a great genius for nothing at all. But perhaps my friend Mr. Acres expects that a boy should show a genius for a thing before he knows any thing about it—no uncommon error! Let us see, however, what the youth looks like. I suppose he is a human creature at least.

Master Samuel Acres was now called in. He came hanging down his head, and looking as if he was going to be flogged.

Come hither, my dear! said Mr. Wiseman—Stand by me, and do not be afraid. Nobody will hurt you. How old are you?

Eleven last May, sir.

A well-grown boy of your age, indeed. You love play, I dare say.

Yes, sir.

What, are you a good hand at marbles?

Pretty good, sir.

And can spin a top and drive a hoop, I suppose?

Yes, sir.

Then you have the full use of your hands and fingers?

Yes, sir.

Can you write, Samuel?

I learned it a little, sir, but I left it off again.

And why so?

Because I could not make the letters.

No! Why, how do you think other boys do? Have they more fingers t you?

r.

ou not able to hold a pen as well as a marble?

nuel was silent.

et me look at your hand.

Samuel held out both his paws, like a dancing bear.

see nothing here to hinder you from writing as well as any boy in e school. You can read, I suppose?

Yes, sir.

Tell me then what is written over the school-room door.

Samuel with some hesitation read, WHATEVER MAN HAS DONE MAN MAY DO.

Pray how did you learn to read?—Was it not with taking pains?

Yes, sir.

Well—taking more pains will enable you to read better. Do you know any thing of the Latin Grammar?

No, sir.

Have you never learned it?

I tried, sir, but I could not get it by heart.

Why, you can say some things by heart. I dare say you can tell e the names of the days of the week in their order.

Yes, sir, I know them.

And the months in the year, perhaps.

Yes, sir.

And you could probably repeat the names of your brothers and sisters, and all your father's servants, and half the people in the village besides.

I believe I could, sir.

Well—and is *hic*, *hæc*, *hoc*, more difficult to remember than these?

Samuel was silent.

Have you learned any thing of accounts?

I went into addition, sir, but I did not go on with it.

Why so?

I could not do it, sir.

How many marbles can you buy for a penny?

Twelve new ones, sir.

And how many for a half-penny?

Six.

And how many for two-pence?

Twenty-four.

If you were to have a penny a day, what would that make in a week?

Seven-pence.

But if you paid two-pence out of that, what would you have left?

Samuel studied awhile, and then said, five-pence.

Right. Why here you have been practising the four great rules of arithmetic, addition, subtraction, multiplication, and division. Learning accounts is no more than this. Well, Samuel, I see what you are fit for. I shall set you about nothing but what you are able to do; but observe, you *must* do it. We have no *I can't* here. Now go among your school-fellows.

Samuel went away, glad that his examination was over, and with more confidence in his powers than he had felt before.

The next day he began business. A boy less than himself was called out to set him a copy of letters, and another was appointed to hear him in grammar. He read a few sentences in English that he could perfectly understand to the master himself. Thus by going on steadily and slowly, he made a sensible progress He had already joined his letters, got all the declensions perfectly, and half the multiplication table, when Mr. Wiseman thought it time to answer his father's letter; which he did as follows:

Sir,

I now think it right to give you some information concerning your son. You perhaps expected it sooner, but I always wish to avoid hasty judgments. You mentioned in your letter that it had not yet been discovered which way his genius pointed. If by *genius* you meant such a decided bent of mind to any one pursuit as will lead to excel with little or no labour or instruction, I must say that I have not met with such a quality in more than three or four boys in my life, and your son is certainly not among the number. But if you mean only the *ability* to do some of those things which the greater part of man-kind can do when properly taught, I can affirm, that I find in him no peculiar deficiency. And whether you choose to bring him up to trade or to some practical profession, I see no reason to doubt that he may in time become sufficiently qualified for it. It is my favourite maxim, sir, that every thing most valuable in this life may generally be acquired by taking pains for it. Your son has already lost much time in the fruitless expectation of finding out what he would take up of his own accord. Believe me, sir, few boys will take up any thing of their own accord but a top or a marble. I will take care while he is with me that he loses no more time this way, but is employed about things that are fit for him, not doubting that we shall find him fit for them.

I am, sir, yours, &c.
SOLON WISEMAN.

Though the doctrine of this letter did not perfectly agree with Mr. Acres' notions, yet being convinced that Mr. Wiseman was more likely to make something of his son than any of his former preceptors, he continued him at his school for some years, and had the satisfaction to find him going on in a steady course of gradual improvement. In due time a profession was chosen for him, which seemed to suit his temper and talents, but for which he had no *particular turn*, having never thought at all about it. He made a respectable figure in it, and went through the world with credit and usefulness, though *without a genius*.

Mrs. Barbauld.

ARITHMETIC.

PART I.

SECTION I.

A.* 1. How many thumbs have you on your right hand? how many on your left? how many on both together?

2. How many hands have you?

3. If you have two nuts in one hand and one in the other, how many have you in both?

4. How many fingers have you on one hand? 4

5. If you count the thumb with the fingers, how many will it make?

6. If you shut your thumb and one finger and leave the rest open, how many will be open?

7. If you have two cents in one hand, and two in the other, how many have you in both?

8. James has two apples, and William has three; if James gives his apples to William, how many will William have?

9. If you count all the fingers on one hand, and two on the other, how many will there be?

10. George has three cents, and Joseph has four; how many have they both together?

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* For the manner of solving questions, and the explanation of the plates, see the key at the end of the book. The first questions in this section are intended for very young children. It will be well for the instructer to give a great many more of this kind.—Older pupils may omit these.

11. Robert gave five cents for an orange, and two for an apple, how many did he give for both?

12. If a custard cost six cents, and an apple two cents; how many cents will it take to buy an apple and a custard?

13. If you buy a pint of nuts for five cents, and an orange for three cents, how many cents would you give for both? how many more for the nuts than for the orange?

14. If an ounce of figs is worth six cents, and a half a pint of cherries is worth three cents; how much are they both worth?

15. Dick had five plums, and John gave him four more; how many had he then?

16. How many fingers have you on both hands?

17. How many fingers and thumbs have you on both hands?

18. If you had six marbles in one hand, and four in the other; how many would you have in the one, more than in the other? how many would you have in both hands?

19. David had seven nuts, and gave three of them to George, how many had he left?

20. Two boys, James and Robert, played at marbles; when they began, they had seven apiece, and when they had done, James had won four; how many had each then?

21. A boy, having eleven nuts, gave away three of them, how many had he left?

22. If you had eight cents, and your papa should give you five more, how many would you have?

23. A man bought a sheep for eight dollars, and a calf for seven dollars, what did he give for both?

24. A man bought a barrel of flour for eight dollars, and sold it for four dollars more than he gave for it; how much did he sell it for?

25. A man bought a hundred weight of sugar for nine dollars, and a barrel of flour for seven dollars, how much did he give for the whole?

26. A man bought three barrels of cider for eight dollars, and ten bushels of apples for nine dollars; how much did he give for the whole?

27. A man bought a firkin of butter for twelve dollars, but, being damaged, he sold it again for eight dollars; how much did he lose?

28. A man bought three sheep for fifteen dollars, but could not sell them again for so much by eight dollars; how much did he sell them for?

29. A man bought sixteen pounds of coffee, and lost seven pounds of it as he was carrying it home, how much had he left?

30. A man bought nineteen pounds of sugar, and having lost a part of it, he found he had nine pounds left; how much had he lost?

31. A man owing fifteen dollars, paid nine dollars of it, how much did he then owe?

32. A man owing seventeen dollars, paid all but seven dollars; how much did he pay?

B. 1. Two and one are how many?
2. Two and two are how many?
3. Three and two are how many?
4. Four and two are how many?
5. Five and two are how many?
6. Six and two are how many?
7. Seven and two are how many?
8. Eight and two are how many?
9. Nine and two are how many?
10. Ten and two are how many?
11. Two and three are how many?
12. Three and three are how many?
13. Four and three are how many?
14. Five and three are how many?

15. Six and three are how many? 9
16. Seven and three are how many? 10
17. Eight and three are how many? 11
18. Nine and three are how many? 12
19. Ten and three are how many? [illegible]
20. Two and four are how many?
21. Three and four are how many?
22. Four and four are how many?
23. Five and four are how many?
24. Six and four are how many?
25. Seven and four are how many?
26. Eight and four are how many?
27. Nine and four are how many?
28. Ten and four are how many?
29. Two and five are how many?
30. Three and five are how many?
31. Four and five are how many?
32. Five and five are how many?
33. Six and five are how many?
34. Seven and five are how many?
35. Eight and five are how many?
36. Nine and five are how many?
37. Ten and five are how many?
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79. Seven and ten are how many?

80. Nine and ten are how many?

81. Ten and ten are how many?

D. 1. Three boys, Peter, John, and Oliver, gave some money to a beggar. Peter gave seven cents; John, four cents; and Oliver, three cents; how many did they all give him?

2. How many did Peter give more than Oliver?

3. Frank had nine pears, and gave three of them to Harry; how many had he left; and how many more than Harry had he then?

4. Dick had ten peaches, Harry twelve, and Charles thirteen; Dick gave three to Stephen, Harry gave him six, and Charles gave him five; how many had Stephen? and how many had each left?

5. A boy had twenty apples, and gave them to his companions, as follows; to one he gave three; to another, two; to another, four; and to another, five; how many did he give away? and how many had he left?

6. A boy gave to one of his companions eight pea[illegible]s; to another, six; to another, four; and kept two himself; how many had he at first?

7. A boy went to the confectioner's and bought three cakes of gingerbread, for which he gave a cent apiece; two buns, for which he gave three cents apiece; one custard for four cents, and one orange for six cents; how many cents did he spend for the whole?

8. A boy having twenty-five cents, bought one quart of cherries for eight cents, one orange for six cents, and gave away three cents; how many cents had he left?

9. A boy bought a box for eighteen cents, and gave eight cents to have it painted, and then sold it for thir--two cents; how much did he gain by the bargain?

10. A man bought a sleigh for seventeen dollars, and gave nine dollars to have it repaired and painted, and then sold it for twenty-three dollars; how much did he lose by the bargain?

11. Eleven and two are how many?
12. Eleven and three are how many?
13. Eleven and four are how many?
14. Eleven and five are how many?
15. Eleven and six are how many?
16. Eleven and seven are how many?
17. Eleven and eight are how many?
18. Eleven and nine are how many?
19. Eleven and ten are how many?
20. Twelve and two are how many?
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38. Fourteen and five are how many?
39. Fourteen and six are how many?
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41. Fifteen and three are how many?
42. Fifteen and four are how many?

43. Fifteen and five are how many?
44. Sixteen and two are how many?
45. Sixteen and three are how many?
46. Sixteen and four are how many?
47. Seventeen and two are how many?
48. Seventeen and three are how many?
49. Eighteen and two are how many?

E. 1. A man bought a sheep for nine dollars, and to pay for it he gave five bushels of corn worth four dollars and the rest in money; how much money did he pay.

2. If a barrel of flour is worth eight dollars, and a hundred weight of sugar is worth twelve dollars; how much more is the sugar worth than the flour?

3. If a man had eleven dollars and should buy three bushels of corn for five dollars, how much money would he have left?

4. A man bought a firkin of butter for fifteen dollars, but it being damaged he was willing to sell it again for eight dollars less than he gave for it; what did he sell it for?

5. A man bought three barrels of flour for eighteen dollars, and sold it again for eleven dollars; what did he lose by the bargain?

6. A man bought a keg of tobacco for thirteen dollars, and sold it again for eighteen; what did he gain by the bargain?

7. Five *less* two are how many?
8. Seven less three are how many?
9. Three less three are how many?
10. Nine less three are how many?
11. Six less two are how many?
12. Seven less four are how many?
13. Eight less three are how many?
14. Five less four are how many?

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15. Seven less five are how many ?
16. Nine less five are how many ?
17. Eight less six are how many ?
18. Eleven less two are how many ?
19. Twelve less four are how many ?
20. Ten less seven are how many ?
21. Thirteen less five are how many?
22. Fourteen less eight are how many ?
23. Twelve less seven are how many ?
24. Seventeen less five are how many ?
25. Eighteen less ten are how many ?
26. Thirteen less seven are how many ?
27. Sixteen less seven are how many ?
28. Fifteen less seven are how many ?
29. Nineteen less six are how many ?
30. Eighteen less five are how many ?
31. Seventeen less eight are how many ?
32. Fourteen less nine are how many ?
33. Sixteen less five are how many ?
34. Fifteen less eight are how many ?
35. Fourteen less nine are how many ?
36. Sixteen less ten are how many ?
37. Seventeen less nine are how many ?
38. Eighteen less seven are how many ?

F. 1. How many are nine and two ? Nineteen and two ? Twenty-nine and two ? Thirty-nine and two ? Forty-nine and two ? Fifty-nine and two ? Sixty-nine and two ? Seventy-nine and two ? Eighty-nine and two ? Ninety-nine and two ?

2. How many are nine and three ? Nineteen and three ? Twenty-nine and three ? Thirty-nine and three ? Forty-nine and three ? Fifty-nine and [illegible] ? Sixty-nine and three ? Seventy-nine and [illegible] ? Eighty-nine and three ? Ninety-nine and [illegible] ?

3. How many are nine and four ? Nineteen and

four ? Twenty-nine and four ? Thirty-nine and four ? Forty-nine and four ? Fifty-nine and four ? Sixty-nine and four ? Seventy-nine and four ? Eighty-nine and four ? Ninety-nine and four ?

4. How many are nine and five ? Nineteen and five ? Twenty-nine and five ? Thirty-nine and five ? Forty-nine and five ? Fifty-nine and five ? Sixty-nine and five ? Seventy-nine and five ? Eighty-nine and five ? Ninety-nine and five ?

5. How many are nine and six ? Nineteen and six ? Twenty-nine and six ? Thirty-nine and six ? Forty-nine and six ? Fifty-nine and six ? Sixty-nine and six ? Seventy-nine and six ? Eighty-nine and six ? Ninety-nine and six ?

6. How many are nine and seven ? Nineteen and seven ? Twenty-nine and seven ? Thirty-nine and seven ? Forty-nine and seven ? Fifty-nine and seven ? Sixty-nine and seven ? Seventy-nine and seven ? Eighty-nine and seven ? Ninety-nine and seven ?

7. How many are nine and eight ? Nineteen and eight ? Twenty-nine and eight ? Thirty-nine and eight ? Forty-nine and eight ? Fifty-nine and eight ? Sixty-nine and eight ? Seventy-nine and eight ? Eighty-nine and eight ? Ninety-nine and eight ?

8. How many are nine and nine ? Nineteen and nine ? Twenty-nine and nine ? Thirty-nine and nine ? Forty-nine and nine ? Fifty-nine and nine ? Sixty-nine and nine ? Seventy-nine and nine ? Eighty-nine and nine ? Ninety-nine and nine ?

9. How many are nine and ten ? Nineteen and ten ? Twenty-nine and ten ? Thirty nine and ten ? Forty-nine and ten ? Fifty-nine and ten ? Sixty-nine and ten ? Seventy-nine and ten ? Eighty-nine and ten ? Ninety-nine and ten ?

10. How many are eight and three ? Eighteen and three ? Twenty-eight and three ? Thirty-eight and three ? Forty-eight and three ? Fifty-eight and

three? Sixty-eight and three? Seventy-eight and three? Eighty-eight and three? Ninety-eight and three?

11. How many are eight and four? Eighteen and four? Twenty-eight and four? Thirty-eight and four? Forty-eight and four? Fifty-eight and four? Sixty-eight and four? Seventy-eight and four? Eighty-eight and four? Ninety-eight and four?

12. How much are eight and five? Eighteen and five? Twenty-eight and five? Thirty-eight and five? Forty-eight and five? Fifty-eight and five? Sixty-eight and five? Seventy-eight and five? Eighty-eight and five? Ninety-eight and five?

13. How many are eight and six? Eighteen and six? Twenty-eight and six? Thirty-eight and six? Forty-eight and six? Fifty-eight and six? Sixty-eight and six? Seventy-eight and six? Eighty-eight and six? Ninety-eight and six?

14. How many are eight and seven? Eighteen and seven? Twenty-eight and seven? Thirty-eight and seven? Forty-eight and seven? Fifty-eight and seven? Sixty-eight and seven? Seventy-eight and seven? Eighty-eight and seven? Ninety-eight and seven?

15. How many are eight and eight? Eighteen and eight? Twenty-eight and eight? Thirty-eight and eight? Forty-eight and eight? Fifty-eight and eight? Sixty-eight and eight? Seventy-eight and eight? Ninety-eight and eight?

16. How many are eight and nine? Eighteen and nine? Twenty-eight and nine? Thirty-eight and nine? Forty-eight and nine? Fifty-eight and nine? Sixty-eight and nine? Seventy-eight and nine? Eighty-eight and nine? Ninety-eight and nine?

17. How many are seven and four? Seventeen and four? Twenty-seven and four? Thirty-seven

and four? Forty-seven and four? Fifty-seven and four? Sixty-seven and four? Seventy-seven and four? Eighty-seven and four? Ninety-seven and four?

18. How many are seven and five? Seventeen and five? Twenty-seven and five? Thirty-seven and five? Forty-seven and five? Fifty-seven and five? Sixty-seven and five? Seventy-seven and five? Eighty-seven and five? Ninety-seven and five?

19. How many are seven and six? Seventeen and six? Twenty-seven and six? Thirty-seven and six? Forty-seven and six? Fifty-seven and six? Sixty-seven and six? Seventy-seven and six? Eighty-seven and six? Ninety-seven and six?

20. How many are seven and seven? Seventeen and seven? Twenty-seven and seven? Thirty-seven and seven? Forty-seven and seven? Fifty-seven and seven? Sixty-seven and seven? Seventy-seven and seven? Eighty-seven and seven? Ninety-seven and seven?

21. How many are seven and eight? Seventeen and eight? Twenty-seven and eight? Thirty-seven and eight? Forty-seven and eight? Fifty-seven and eight? Sixty-seven and eight? Seventy-seven and eight? Eighty-seven and eight? Ninety-seven and eight?

22. How many are seven and nine? Seventeen and nine? Twenty-seven and nine? Thirty-seven and nine? Forty-seven and nine? Fifty-seven and nine? Sixty-seven and nine? Seventy-seven and nine? Eighty-seven and nine? Ninety-seven and nine?

23. How many are six and five? Sixteen and five? Twenty-six and five? Thirty-six and five? Forty-six and five? Fifty-six and five? Sixty-six and five? Seventy-six and five? Eighty-six and five? Ninety-six and five?

24. How many are six and six? Sixteen and six? Twenty-six and six? Thirty-six and six? Forty-six and six? Fifty-six and six? Sixty-six and six? Seventy-six and six? Eighty-six and six? Ninety-six and six?

25. How many are six and seven? Sixteen and seven? Twenty-six and seven? Thirty-six and seven? Forty-six and seven? Fifty-six and seven? Sixty-six and seven? Seventy-six and seven? Eighty-six and seven? Ninety six and seven?

26. How many are six and eight? Sixteen and eight? Twenty-six and eight? Thirty-six and eight? Forty-six and eight? Fifty-six and eight? Sixty-six and eight? Seventy-six and eight? Eighty-six and eight? Ninety-six and eight?

27. How many are six and nine? Sixteen and nine? Twenty-six and nine? Thirty-six and nine? Forty-six and nine? Fifty-six and nine? Sixty-six and nine? Seventy-six and nine? Eighty-six and nine? Ninety-six and nine?

28. How many are five and six? Fifteen and six? Twenty-five and six? Thirty-five and six? Forty-five and six? Fifty-five and six? Sixty-five and six? Seventy-five and six? Eighty-five and six? Ninety-five and six?

29. How many are five and seven? Fifteen and seven? Twenty-five and seven? Thirty-five and seven? Forty-five and seven? Fifty-five and seven? Sixty-five and seven? Seventy-five and seven? Eighty-five and seven? Ninety-five and seven?

30 How many are five and eight? Fifteen and eight? Twenty-five and eight? Thirty-five and eight? Forty-five and eight? Fifty-five and eight? Sixty-five and eight? Seventy-five and eight? Eighty-five and eight? Ninety-five and eight?

31. How many are five and nine? Fifteen and nine? Twenty-five and nine? Thirty-five and nine

Forty-five and nine? Fifty-five and nine? Sixty-five and nine? Seventy-five and nine? Eighty-five and nine? Ninety-five and nine?

32. How many are four and seven? Fourteen and seven? Twenty-four and seven? Thirty-four and seven? Forty-four and seven? Fifty-four and seven? Sixty-four and seven? Seventy-four and seven? Eighty-four and seven? Ninety-four and seven?

33. How many are four and eight? Fourteen and eight? Twenty-four and eight? Thirty-four and eight? Forty-four and eight? Fifty-four and eight? Sixty-four and eight? Seventy-four and eight? Eighty-four and eight? Ninety-four and eight?

34. How many are four and nine? Fourteen and nine? Twenty-four and nine? Thirty-four and nine? Forty-four and nine? Fifty-four and nine? Sixty-four and nine? Seventy-four and nine? Eighty-four and nine? Ninety-four and nine?

35. How many are three and eight? Thirteen and eight? Twenty-three and eight? Thirty-three and eight? Forty-three and eight? Fifty-three and eight? Sixty-three and eight? Seventy-three and eight? Eighty-three and eight? Ninety-three and eight?

36. How many are three and nine? Thirteen and nine? Twenty-three and nine? Thirty-three and nine? Forty-three and nine? Fifty-three and nine? Sixty-three and nine? Seventy-three and nine? Eighty-three and nine? Ninety-three and nine?

37. How many are two and nine? Twelve and nine? Twenty-two and nine? Thirty-two and nine? Forty-two and nine? Fifty-two and nine? Sixty-two and nine? Seventy-two and nine? Eighty-two and nine? Ninety-two and nine?

G. 1. A man bought a firkin of butter for nine dollars, a keg of molasses for six dollars, and five

bushels of wheat for seven dollars; how much did he give for the whole?

2. A boy gave some apples to his companions, to one he gave seven, to another six, and to another eight; how many did he give to the whole?

3. A man bought a cow for seventeen dollars, a sheep for nine, and a calf for seven; how much did he give for the whole?

4. A drover bought sheep as follows, of one man he bought twenty-seven, of another eight, of another ten, and of another five; afterwards he sold nine of them; how many had he then?

5. A lady bought a comb for thirty-seven cents, some tape for eight cents, some pins for ten cents, some needles for six cents, and some thread for six cents; she gave seventy-five cents; how much change ought she to receive back?

6. Eight, and nine, and six, are how many?

7. Five, and seven, and three, are how many?

8. Four, and three, less two, are how many?

9. Seven, and five, less three, are how many?

10. Sixteen, and nine, and three, are how many?

11. Twenty-three and eight are how many?

12. Twenty-seven and five are how many?

13. Twenty-five, less eight, are how many?

14. Thirty-two and seven, less nine, are how many?

15. Thirty-eight, and six, and four, less seven, are how many?

16. Forty-four, and eight, and three, and seven, are how many?

17. Fifty-two, and six, and four, and five, and three, are how many?

18. Fifty-seven, and six, and three, and five, and two, less eight, are how many?

19. Sixty-three, and five, and four, and six, and two, less seven, are how many?

20. Seventy-five, and six, and eight, and three, and seven, and four, less nine, are how many ?

21. Eighty-three, and six, and five, and two, and seven, and nine, less four, are how many ?

22. Fifty-eight, and ten, and five, and seven, and three, and six, and four, less nine, are how many ?

23. Sixty-seven, and five, and eight, and nine, and seven, less six, are how many ?

24. Seventy-four, and nine, and seven, and five, and two, less six, are how many ?

25. Seventy-eight, and seven, and six, and two, and five, and eight, less nine, are how many ?

26. Eighty-four, and seven, and six, and eight, and five, less ten, are how many ?

27. Forty-seven, and eight, and six, and two, and four, and eight, and three, and seven, and ten, and nine, less five, are how many ?

28. Thirty-five, and eight, and four, and six, and three, and four, less eleven, are how many ?

29. Seventy, and ten, and six, and nine, and seven, and two, and five, and eight, and nine, less three, are how many ?

H. 1. A man bought a cow for twenty-eight dollars, and a sheep for four dollars, and a pig for seven dollars; how much did he give for the whole ? 39

2. James had twenty-seven cents ; John gave him four more, David seven, and George eleven, and he bought nine cents worth of cake ; how many cents had he left ?

3. A man paid sixteen dollars to A, nine dollars to B, seven dollars to C, ten dollars to D, six dollars to E, four dollars to F, and had eight dollars left; how many had he at first ?

4. From Boston to Roxbury it is three miles ; from Roxbury to Dedham, six miles ; from Dedham to Wal-le, eleven miles ; from Walpole to Wrentham, four

miles; from Wrentham to Attleborough, four miles; from Attleborough to Pawtucket, nine miles; from Pawtucket to Providence, four miles; how many miles is it from Boston to Providence? 37

5. One boy had fifteen nuts; another boy gave him seven; another, nine; and another gave him enough to make his number forty; how many did the last boy give him? 9

6. A boy had thirty-seven apples; he gave five to one companion; and eight to another; and when he had given some to another, he had six left; how many did he give to the last? 18

7. A man owed fifty-six dollars; at one time he paid seventeen dollars; at another, eight; at another, five; at another, seven; at last he paid the rest of the debt, wanting four dollars; how much was the last payment? 15

8. Six men bought a horse for seventy dollars; the first gave twenty-three dollars; the second, fifteen; the third, twelve; the fourth, nine; the fifth, seven; how much did the sixth give? 4

9. A man bought a horse for forty-five dollars, and paid fifteen dollars for keeping him; he let him enough to receive twenty dollars; and then sold him for forty-three dollars; did he gain or lose by the bargain? and how much? gained 3

SECTION II.

A. 1. What cost three yards of tape, at two cents a yard?*

2. What cost four apples, at two cents apiece?

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* The pupil should be made to observe that three yards will cost three times as much as one yard; and say, if one yard cost two cents, three yards will cost three times two cents. He should be made to give this reason for the solution of each question, varying the numbers according to the question.

3. What cost five peaches, at three cents apiece?

4. What must you give for two oranges, at six cents apiece?

5. What would be the price of three barrels of cider, at three dollars a barrel?

6. If one orange is worth three apples; how many apples are four oranges worth? 12

7. What are two barrels of flour worth, at five dollars a barrel?

8. What cost three yards of cloth, at four dollars a yard?

9. What cost two pounds of raisins, at eight cents a pound?

10. What cost three lemons, at six cents apiece?

11. If a man travel three miles in an hour, how many miles will he travel in four hours?

12. What will five pair of shoes come to, at two dollars a pair?

13. What is the price of seven yards of cloth, at three dollars a yard?

14. What is the value of two pounds of beef, at seven cents a pound?

15. If there are three feet in one yard, how many feet are there in four yards?

16. How many feet are there in seven yards?

17. How many feet are there in six yards and two feet?

18. If a man earn seven dollars in one week, how much would he earn in five weeks?

19. What cost seven hundred weight of sugar, at nine dollars a hundred weight?

20. What cost seven pounds of sugar, at ten cents a pound?

21. If one half yard of cloth cost three dollars, what would three yards cost?

22. If one quarter of a yard of cloth cost two dollars, what is that a yard?

23. How many yards of cloth are there in seven pieces, each piece containing ten yards?

24. What will five barrels of flour cost, at six dollars a barrel?

25. If a man can travel four miles in an hour, how far can he travel in eight hours?

26. If it take four bushels of wheat to make a barrel of flour, how many bushels will it take to make seven barrels?

B. 1. Two times one are how many?*
2. Two times two are how many?
3. Two times three are how many?
4. Two times four are how many?
5. Two times five are how many?
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10. Two times ten are how many?
11. Three times one are how many?
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20. Three times ten are how many?
21. Four times one are how many?
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25. Four times five are how many?
26. Four times six are how many?

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* See the Key.

27. Four times seven are how many ?
28. Four times eight are how many ?
29. Four times nine are how many ?
30. Four times ten are how many ?
31. Five times one are how many ?
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51. Seven times one are how many ?
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82. Ten times two are how many?
83. Ten times three are how many?
84. Ten times four are how many?
85. Ten times five are how many?
86. Ten times six are how many?
87. Ten times seven are how many?
88. Ten times eight are how many?
89. Ten times nine are how many?
90. Ten times ten are how many?

C. 1. Two times two are how many times one?
2. Three times two are how many times one?
3. Four times two are how many times one?
4. Five times two are how many times one?
5. Seven times two are how many?
6. Nine times two are how many?
7. Six times two are how many?
8. Eight times two are how many?
9. Ten times two are how many?

10. Two times three are how many ?
11. Three times three are how many ?
12. Four times three are how many ?
13. Five times three are how many ?
14. Six times three are how many ?
15. Eight times three are how many ?
16. Seven times three are how many ?
17. Ten times three are how many ?
18. Nine times three are how many ?
19. Two times four are how many ?
20. Six times four are how many ?
21. Four times four are how many ?
22. Seven times four are how many ?
23. Nine times four are how many ?
24. Three times four are how many ?
25. Five times four are how many ?
26. Ten times four are how many ?
27. Eight times four are how many ?
28. Two times five are how many ?
29. Five times five are how many ?
30. Three times five are how many ?
31. Six times five are how many ?
32. Two times six are how many ?
33. Four times five are how many ?
34. Seven times five are how many ?
35. Three times six are how many ?
36. Seven times six are how many ?
37. Seven times seven are how many ?
38. Four times eight are how many ?
39. Six times seven are how many ?
40. Eight times nine are how many ?
41. Six times eight are how many ?
42. Three times seven are how many ?
43. Four times nine are how many ?
44. Three times eight are how many ?
45. Six times six are how many ?
46. Six times nine are how many ?

47. Nine times five are how many ?
48. Four times six are how many ?
49. Two times nine are how many ?
50. Seven times nine are how many ?
51. Nine times eight are how many ?
52. Two times eight are how many ?
53. Three times ten are how many ?
54. Eight times seven are how many ?
55. Five times six are how many ?
56. Five times eight are how many ?
57. Two times seven are how many ?
58. Two times six are how many ?
59. Eight times six are how many ?
60. Four times seven are how many ?
61. Eight times eight are how many ?
62. Ten times five are how many ?
63. Seven times ten are how many ?
64. Ten times ten are how many ?
65. Nine times six are how many ?
66. Five times nine are how many ?
67. Three times nine are how many ?
68. Nine times seven are how many ?
69. Five times ten are how many ?
70. Seven times eight are how many ?
71. Five times seven are how many ?
72. Ten times eight are how many ?
73. Ten times seven are how many ?
74. Nine times ten are how many ?
75. Eight times five are how many ?
76. Nine times nine are how many ?
77. Four times ten are how many ?
78. Ten times six are how many ?
79. Eight times ten are how many ?
80. Ten times nine are how many ?

D. 1. What cost three yards of cloth, at five dollars a yard ?

2. What cost four oranges, at six cents apiece ?

3. What cost seven barrels of cider, at three dollars a barrel ?

4. How much do three barrels of beer come to, at seven dollars a barrel ?

5. What cost four firkins of butter, at eight dollars a firkin ?

6. What do nine pounds of veal come to, at six cents a pound ?

7. What cost six reams of paper, at five dollars per ream ?

8. What cost eight pair of shoes, at three dollars a pair ?

9. What is the value of nine yards of cloth, at six dollars a yard ?

10. If a man travel five miles in an hour, how many miles will he travel in nine hours ?

11. There is an orchard consisting of ten rows of trees, and nine trees in each row ; how many trees are there in the orchard ?

12. On a chess board there are eight rows of squares, and eight squares in each row ; how many squares are there on the board ?

13. In one penny there are four farthings; how many farthings are there in six pence ?

14. How many farthings are there in eight pence ?

15. How many farthings are there in nine pence ?

16. How many farthings are there in ten pence?

17. In one shilling there are twelve pence; how many farthings are there in a shilling ?

18. In one pint, there are four gills; how many gills are there in five pints ?

19. In one quart there are two pints ; how many pints are there in six quarts ?

20. How many pints are there in three quarts ?

21. How many gills are there in six pints?

22. How many gills are there in one quart?

23. How many gills are there in three quarts?

24. In one gallon there are four quarts; how many quarts are there in three gallons?

25. How many quarts are there in five gallons?

26. How many quarts are there in seven gallons?

27. How many pints are there in one gallon?

28. How many pints are there in three gallons?

29. How many gills are there in one gallon?

30. How many gills are there in five quarts?

31. How many gills are there in two gallons?

32. A person bought two oranges, at six cents apiece; and seven lemons, at four cents apiece; and five pears, at two cents apiece; how much did the whole come to? 5

33. If one pint of gin cost eight cents, what will one quart cost?

34. If one gill of brandy cost four cents, what will one quart cost?

35. If one gill of beer cost two cents, what will one gallon cost?

36. If a stage runs seven miles in an hour, how far will it run in nine hours?

37. Two men start from the same place and travel different ways; one travels two miles in an hour; the other travels three miles in an hour; how far apart will they be at the end of one hour? How far at the end of two hours? How far at the end of three hours? How far at the end of four hours?

38. Two men start from the same place and travel the same way; one travels at the rate of two miles in an hour; the other, four; how far apart will they be in one hour? How far in two hours? ow far in four hours?

39. If three men can do a piece of work in two

days, how many days would it take one man to do it ?

40. If four men can do a piece of work in five days, how many days would it take one man to do it ? 20

41. If six men can do a piece of work in seven days, how many men would it take to do it in one day ? 42

42. If a quantity of provisions will serve three men five days, how many men would it serve one day ? 15

43. If a quantity of provisions will serve five men seven days, how many days would it serve one man ? 35

44. If fifteen dollars worth of provision will serve eight men five days, how many days will it serve one man ? 40

45. A man had a piece of work to perform which seven men could do in nine days, but it was necessary that the whole should be completed in one day ; how many men must he employ ? 63

46. If the interest of one dollar is six cents a year, what would be the interest of ten dollars for the same time ?

47. If the interest of one dollar is six cents for one year, what would be the interest of it for two years ? for three years ? for seven years ?

48. If a man can earn seven shillings in a day, how many shillings will he earn in six days ?

49. If a man can earn eight dollars in a month, how much can he earn in six months ?

50. At five dollars a week, what will nine weeks board come to ?

51. A lady bought three yards of cambric at two dollars a yard, seven yards of silk for three dollars a yard, five yards of riband for four dollars, and some crape for two dollars ; she paid four ten-dollar bills ; how much must she receive back again ?

SECTION III.

A. 1. How many apples, at one cent apiece, can you buy for four cents?

2. How many pears, at two cents apiece, can you buy for four cents?

3. How many peaches, at three cents apiece, can you buy for six cents?

4. How many apples, at two cents apiece, can you buy for six cents? How many for eight cents?

5. How many pears, at three cents apiece, can you buy for nine cents? How many for twelve cents?

6. If you have eight apples to give to four boys, how many can you give to each?

7. If a man travel six miles in two hours, how many miles does he travel in an hour?

8. If a man travel three miles in an hour, how many hours will it take him to travel nine miles?

9. How many yards of cloth, at three dollars a yard, can you buy for fifteen dollars?

10. If you had sixteen cents, how many cakes could you buy at four cents apiece?

11. If you had ten dollars, how much cloth could you buy at five dollars a yard?

12. If you had twelve apples to give to six of your companions, how many would you give them apiece?

13. If a man can travel six miles in an hour, how long will it take him to travel eighteen miles?

14. If a man can travel five miles in an hour, how long will it take him to travel twenty miles?

15. In a certain orchard there are twenty-four trees standing in rows, and there are three trees in each row, how many rows are there?

16. In an orchard there are twenty-one trees, and there are seven trees in each row, how many rows are there ?

17. A man paid twenty-seven dollars for some sheep, and he gave nine dollars apiece for them, how many sheep did he buy ?

18. A man paid twenty-eight dollars for seven barrels of cider, how much did he give a barrel ?

19. At five cents apiece, how many oranges can you buy for thirty cents ?

20. Twenty-five are how many times five ?

21. Thirty-two are how many times four ? How many times eight ?

22. Thirty-five are how many times seven ? How many times five ?

23. Thirty-six are how many times six ? How many times nine ? How many times four ?

B. *Remark.* When any thing, or any number, is divided into two equal parts, one of the parts is called the half of the thing or the number.

1. If an apple is worth two cents, what is one half of it worth ?

2. What is one half of two cents ?

Ans. One cent.

Q. Why ?

A. Because if you divide two cents into two equal parts, one of the parts is one cent.

3. If you can buy a cake for two cents, how much can you buy for one cent ?

4. One is what part of two ?

Ans. One is the half part of two.

5. Two times one are how many times two ?

6. If you can buy one pear for two cents, how many can you buy for three cents ?

7. Three, are how many times two ?

Ans. Once two and one half of two.

8. Four are how many times two?

9. If two shillings will buy one yard of cotton cloth, how many yards will five shillings buy?

10. Five are how many times two?

Ans. Two times two and half of two.

11. Six are how many times two?

12. If two dollars will buy a yard of cloth, how many yards will seven dollars buy?

13. How many halves make a whole one?

14. Eight are how many times two?

15. Nine are how many times two?

16. Ten are how many times two?

Remark. When any thing, or any number, is divided into three equal parts, one of those parts is called the *third* part of the thing or number. When it is divided into four equal parts, one part is called the *fourth* part, and so on.

17. If a yard of cloth be worth three dollars, and it be cut into three equal pieces, what will one of the pieces be worth? that is, what will one third of a yard be worth?

18. What is a third of three?

19. Suppose the yard of cloth to be cut as before, what will two pieces of it cost? that is, what will two thirds of a yard cost?

20. What is two thirds of three?

21. If three shillings will buy one bushel of corn, what part of a bushel will one shilling buy? What part of a bushel will two shillings buy?

22. One is what part of three?

Ans. One is the third part of three; or one third of three.

23. Two is what part of three?

Ans. Two is two times the third part of three; or two thirds of three.*

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* The instructer may use either of these expressions; the former will be most easily understood by the pupil; it would be well, there-

24. Three times one are how many times three?

25. If you can buy a barrel of cider for three dollars, how much can you buy for four dollars? How much for five dollars?

26. How many thirds make a whole one?

27. Five are how many times three?

Ans. Once three, and two thirds of three.

28. Six are how many times three?

29. If you can buy a barrel of fish for three dollars, how much can you buy for seven dollars? How much for eight dollars?

30. What do you understand, by a third, and by two thirds of any thing?

For the answer, see remark after example 16th.

31. Eight are how many times three?

32. Nine are how many times three?

33. Ten are how many times three?

34. Eleven are how many times three?

35. Twelve are how many times three?

36. If a yard of cloth be worth four dollars, and it be cut into four equal parts, what will one of the parts be worth? that is, what is one fourth of it worth? What are two fourths of it worth? What are three fourths of it worth?

37. If you can buy a barrel of cider for four dollars, how much can you buy for one dollar? How much for two dollars? How much for three dollars?

38. What part of four is one?

Ans. One is the fourth part of four.

39. What part of four is two?

Ans. Two fourths of four.

40. What part of four is three?

Ans. Three fourths of four.

41. How many fourths make a whole one?

42. If you can buy a bushel of corn for four shil-

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ble, for the instructer to use the former frequently, though the latter is used for the most part in this treatise.

lings, how much can you buy for five shillings? How much for six shillings? How much for seven shillings?

43. Five are how many times four?

Ans. Once four and one fourth of four.

44. Six are how many times four?

Ans. Once four, and two fourths of four.

45. Seven are how many times four?

Ans. Once four, and three fourths of four.

46. Eight are how many times four?

47. If four bushels of corn will buy one yard of cloth, how many yards will nine bushels buy? How many yards will ten bushels buy? How many yards will eleven bushels buy?

48. What do you understand by one fourth, two fourths, or three fourths of any thing?

See remark after example 16th.

49. Ten are how many times four?

50. Eleven are how many times four?

51. Twelve are how many times four?

52. Thirteen are how many times four?

53. Fourteen are how many times four?

54. Fifteen are how many times four?

55. Sixteen are how many times four?

56. If a barrel of flour be worth five dollars, and it be divided equally among five men, what will one man's share be worth? that is, what is one fifth of a barrel worth? What are two fifths of it worth? What are three fifths of it worth? What are four fifths of it worth?

57. If five dollars will buy one box of butter, what part of a box will one dollar buy? What part will two dollars buy? What part will three dollars buy? What part will four dollars buy?

58. What part of five is one?

Ans. One is the fifth part of five.

59. Two is what part of five?

Ans. Two fifths of five.

60. Three is what part of five?

Ans. Three fifths of five.

61. Four is what part of five?

62. How many fifths make a whole one?

63. If cherries are five cents a quart, how many quarts can you buy for six cents? How many for seven cents? How many for eight cents? How many for nine cents? How many for eleven cents? How many for thirteen cents?

64. What do you understand by one fifth, two fifths, &c. of any thing?

See remark after example 16th.

65. Seven are how times five?

Ans. Once five and two fifths of five.

66. Eight are how many times five?

67. Nine are how many times five?

68. Ten are how many times five?

69. Eleven are how many times five?

70. Twelve are how many times five?

71. Thirteen are how many times five?

72. Fourteen are how many times five?

73. Fifteen are how many times five?

74. If a barrel of beef cost six dollars, and it were divided into six equal parts, what would one of the parts be worth? that is, what is one sixth of it worth? What are two sixths of it worth? What are three sixths of it worth? Four sixths? Five sixths?

75. If fish is worth six dollars a barrel, what part of a barrel will one dollar buy? What part of a barrel will two dollars buy? Three dollars? Four dollars? Five dollars?

76. What part of six is one?

Ans. One is the sixth part of six.

77. What part of six is two?

Ans. Two sixths of six.

78. Three is what part of six?

Ans. Three sixths of six.

79. Four is what part of six?

80. How many sixths make a whole one?

81. How much rye at six shillings a bushel can you buy for seven shillings? How much for eight shillings? Nine shillings? Ten shillings? Eleven shillings? Twelve shillings? Thirteen shillings? Fifteen shillings? Seventeen shillings?

82. What do you understand by one sixth, two sixths, &c.

83. Eight are how many times six?

Ans. One time six and two sixths of six.

84. Nine are how many times six?

85. Ten are how many times six?

86. Eleven are how many times six?

87. Twelve are how many times six?

88. Thirteen are how many times six?

89. Fourteen are how many times six?

90. Fifteen are how many times six?

91. If coal is worth seven dollars a chaldron, what is one seventh of a chaldron worth? What are two sevenths of a chaldron worth? Three sevenths? Four sevenths? Five sevenths? Six sevenths?

92. At the rate of seven dollars a yard, how much broadcloth can you buy for one dollar? How much for two dollars? How much for three dollars? How much for four dollars? How much for five dollars? How much for six dollars? How much for eight dollars? How much for ten dollars? How much for twelve dollars? How much for fifteen dollars?

93. What part of seven is one?

Ans. One is one seventh of seven.

94. What part of seven is two?

Ans. Two sevenths of seven.

95. What part of seven is three?

96. Four is what part of seven?

97. Five is what part of seven?

98. What do you understand by one seventh, two sevenths, &c. of any thing?

99. How many sevenths make a whole one?

100. Nine are how many times seven?

101. Ten are how many times seven?

102. Eleven are how many times seven?

103. Twelve are how many times seven?

104. Thirteen are how many times seven?

105. Fourteen are how many times seven?

106. Fifteen are how many times seven?

107. Sixteen are how many times seven?

108. When wheat is eight shillings a bushel, what is one eighth of a bushel worth? What are two eighths of a bushel worth? What are three eighths of a bushel worth? What are four eighths of a bushel worth? Five eighths? Six eighths? Seven eighths?

109. When wood is eight dollars a cord, what part of a cord can you buy for a dollar? What part of a cord can you buy for two dollars? What part for three dollars? What part for four dollars? What part for five dollars? What part for six dollars? What part for seven dollars? How much can you buy for nine dollars? How much for ten dollars? How much for eleven dollars? How much for thirteen dollars? How much for fifteen dollars? How much for nineteen dollars?

110. What part of eight is one?

111. What part of eight is two?

112. Three is what part of eight?

113. Four is what part of eight?

114. Five is what part of eight?

115. What do you understand by one eighth, two eighths, &c. of any number?

116. Seven is what part of eight?

117. How many eighths make a whole one ?

118. Ten are how many times eight ?

119. Eleven are how many times eight ?

120. Twelve are how many times eight ?

121. Thirteen are how many times eight ?

122. Fourteen are how many times eight ?

123. When sugar is nine dollars a hundred weight, what is one ninth of a hundred weight worth ? What are two ninths of a hundred weight worth ? Three ninths ? Four ninths ? Five ninths ? Six ninths ? Seven ninths ? Eight ninths ?

124. When rye is nine shillings a bushel, what part of a bushel can you buy for one shilling ? What part for two shillings ? What part for three shillings ? For four shillings ? For five shillings ? For six shillings ? Seven shillings ? Eight shillings ? How much for ten shillings ? For thirteen shillings ? For fourteen shillings ? Sixteen shillings ? Twenty shillings ?

125. What do you understand by one ninth, two ninths, three ninths, &c. of any number ?

126. Three is what part of nine ?

127. Four is what part of nine ?

128. Five is what part of nine ?

129. Seven is what part of nine ?

130. How many ninths make a whole one ?

131. Thirteen are how many times nine ?

132. Fifteen are how many times nine ?

133. Seventeen are how many times nine ?

134. When hay is ten dollars a ton, what is one tenth of a ton worth ? What are two tenths of a ton worth ? What are three tenths of a ton worth ? Four tenths ? Five tenths ? Six tenths ? Seven tenths? Eight tenths ? Nine tenths ?

135. When sugar is ten dollars a hundred weight, what part of a hundred weight can you buy for one dollar ? What part for two dollars ? What part for

three dollars? What part for four dollars? What part for five dollars? Six dollars? Seven dollars? Eight dollars? Nine dollars? How much can you buy for eleven dollars? Thirteen dollars? Fifteen dollars? Seventeen dollars?

136. What do you understand by one tenth, two tenths, three tenths, &c. of any thing?*

137. How many tenths make a whole one?*

C. Instead of writing the names of numbers, it is usual to express them by particular characters, called *figures.*

One is written	1
Two is written	2
Three is written	3
Four is written	4
Five is written	5
Six is written	6
Seven is written	7
Eight is written	8
Nine is written	9
Ten is written	10

1. Eleven times one are how many times 2?

2. Twelve are how many times 2? 3? 4?

3. Fourteen are how many times 2? 4? 3?.

4. If you had fifteen cents how many cakes could you buy at 4 cents apiece? How many at 2 cents apiece? How many at 3 cents apiece? How many at 5 cents apiece?

5. Fifteen are how many times 4? 2? 3? 5?

6. Sixteen are how many times 5? 3? 6? 2? 7? 4?

7. Seventeen are how many times 6? 2? 7? 3? 5? 4?

8. Eighteen are how many times 4? 7? 9? 6? 3? 2? 5? 8?

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* These questions should frequently be put to the learners.

9. Nineteen are how many times 3? 7? 4? 5? 8? 6? 9? 2? 10?

10. Twenty are how many times 6? 2? 8? 3? 9? 4? 10? 5? 7?

11. Twenty-one are how many times 7? 3? 8? 2? 4? 6? 9? 5? 10?

12. Twenty-two are how many times 3? 8? 5? 4? 9? 6? 7? 10? 2?

13. If you had twenty-seven dollars, how much cloth could you buy at 9 dollars a yard? How much at 6 dollars a yard? How much at 4 dollars a yard? How much at 3 dollars a yard? How much at 7 dollars a yard? How much at 8 dollars a yard? How much at 5 dollars a yard? How much at 10 dollars a yard?

14. Twenty-seven are how many times 9? 6? 4? 3? 7? 8? 5? 10?

15. Twenty-four are how many times 6? 8? 7? 5? 2? 10? 3? 4? 9?

16. Twenty-nine are how many times 3? 7? 5? 9? 6? 8? 4? 10?

17. Twenty-three are how many times 4? 2? 7? 8? 3? 9? 6? 5? 10?

18. Twenty-five are how many times 3? 7? 2? 6? 9? 4? 8? 5? 10?

19. Thirty are how many times 10? 2? 3? 7? 9? 6? 5? 4? 8?

20. Thirty-three are how many times 6? 8? 7? 4? 9? 5? 10? 3?

21. Twenty-six are how many times 9? 4? 7? 3? 8? 5? 6? 10?

22. Thirty-five are how many times 5? 6? 3? 7? 9? 10? 4? 8?

23. Thirty-eight are how many times 8? 6? 3? 9? 5? 4? 7? 10?

24. Thirty-four are how many times 7? 3? 9? 10? 6? 8? 4? 5?

25. Thirty-six are how many times 8? 9? 4? 5? 3? 6? 7? 10?

26. Forty are how many times 8? 10? 6? 4? 3? 9? 5? 7?

27. For forty-seven cents, how many pounds of meat can be bought at 6 cents a pound? How many pounds at 8 cents? How many at 9 cents? How many at 3 cents? How many at 5 cents? How many at 4 cents? How many at 7 cents? How many at 10 cents a pound?

28. Forty-seven are how many times 6? 8? 9? 3? 5? 4? 7? 10?

29. Forty-three are how many times 9? 8? 7? 6? 4? 3? 5? 10?

30. Forty-five are how many times 10? 8? 3? 6? 4? 7? 5? 9?

31. Forty-nine are how many times 6? 10? 5? 9? 4? 8? 7?

32. Fifty-three are how many times 8? 5? 6? 4? 7? 9? 10?

33. Fifty-seven are how many times 9? 7? 10? 6? 5? 8? 4?

34. Fifty-five are how many times 6? 4? 8? 10? 9? 7? 5?

35. Forty-eight are how many times 7? 5? 9? 4? 6? 8? 10?

36. Fifty-four are how many times 5? 9? 6? 4? 7? 10? 8?

37. Forty-four are how many times 4? 6? 9? 7? 5? 8? 10?

38. Fifty-eight are how many times 7? 6? 8? 4? 9? 5? 10?

39. Forty-six are how many times 8? 10? 4? 6? 9? 7? 5?

40. Fifty are how many times 9? 5? 4? 10? 8? 6? 7?

41. Fifty-nine are how many times 4? 8? 7? 6? 10? 9? 5?

42. Sixty-four are how many times 7? 5? 8? 10? 6? 9?

43. Sixty-eight are how many times 6? 8? 9? 7? 10? 5?

44. Fifty-two are how many times 4? 6? 8? 10? 5? 7? 9?

45. Sixty-three are how many times 5? 4? 6? 10? 9? 7? 8?

46. Sixty-two are how many times 4? 10? 9? 7? 8? 5? 6?

47. Seventy-three are how many times 10? 7? 8? 6? 5? 9?

48. Seventy-five are how many times 7? 8? 10? 5? 6? 9?

49. If you had sixty-seven dollars, how many barrels of flour could you buy at 5 dollars a barrel? How many at 7 dollars a barrel? How many at 6 dollars a barrel? How many at 8 dollars a barrel? How many at 10 dollars a barrel? How many at 9 dollars a barrel?

50. Sixty-seven are how many times 5? 7? 6? 8? 10? 9?

51. Seventy-four are how many times 10? 7? 8? 6? 5? 9?

52. Sixty are how many times 9? 10? 6? 4? 7? 5? 8?

53. Seventy-two are how many times 5? 7? 6? 8? 10? 9?

54. Sixty-five are how many times 5? 10? 8? 6? 7? 9?

55. Sixty-one are how many times 4? 5? 7? 6? 8? 10? 9?

56. Seventy-nine are how many times 10? 9? 8? 7? 6? 5?

57. Seventy are how many times 9? 5? 6? 8? 7? 10?

58. Eighty-two are how many times 10? 7? 8? 6? 9?

59. Sixty-six are how many times 9? 5? 6? 7? 10? 8?

60. Eighty are how many times 10? 7? 6? 8? 9?

61. Sixty-nine are how many times 9? 5? 7? 10? 8? 6?

62. Eighty-one are how many times 10? 6? 8? 7? 9?

63. Seventy-six are how many times 9? 5? 10? 6? 7? 8?

64. Eighty-three are how many times 10? 6? 7? 9? 8?

65. Seventy-one are how many times 9? 5? 7? 6? 8? 10?

66. Eighty-four are how many times 10? 6? 8? 9? 7?

67. Seventy-seven are how many times 9? 7? 5? 10? 8? 6?

68. Eighty-five are how many times 10? 8? 7? 6? 9?

69. Ninety are how many times 9? 10? 6? 7? 8?

70. Eighty-six are how many times 10? 9? 6? 7? 8?

71. Ninety-four are how many times 9? 10? 8? 6? 7?

72. Eighty-seven are how many times 10? 9? 7? 6? 8?

73. Ninety-two are how many times 9? 10? 6? 7? 8?

74. Eighty-eight are how many times 10? 9? 8? 6? 7?

75. Ninety-five are how many times 9 ? 10 ? 6 ? 8 ? 7 ?

76. Eighty-nine are how many times 10 ? 9 ? 6 ? 7 ? 8 ?

77. Ninety-eight are how many times 10 ? 9 ? 8 ? 6 ? 7 ?

78. Ninety-four are how many times 9 ? 10 ? 6 ? 8 ? 7 ?

79. One hundred are how many times 6 ? 10 ? 8 ? 9 ? 7 ?

80. Ninety-three are how many times 10 ? 6 ? 9 ? 8 ? 7 ?

81. Ninety-nine are how many times 7 ? 10 ? 8 ? 6 ? 9 ?

82. Ninety-six are how many times 9 ? 8 ? 7 ? 6 ? 10 ?

83. Ninety-seven are how many times 10 ? 9 ? 6 ? 7 ? 8 ?

D. 1. If an orange is worth 3 apples, how many oranges are fifteen apples worth ? 5

2. In 8 pints how many quarts ? 4

3. In 8 gills how many pints ?

4. If you divide twelve apples equally among three boys, how many would you give them apiece ?

5. How many hours would it take you to travel 10 miles, if you travel three miles in an hour ?

6. How many pence are there in eight farthings ?

7. How many pence are there in twelve farthings ?

8. How many pence are there in seventeen farthings ?

9. How many gallons are there in ten quarts ?

10. How much broadcloth, at 6 dollars a yard, can you buy for seventeen dollars ?

11. How many pounds of raisins, at 8 cents a pound, can you buy for twenty-five cents ?

12. In twenty-eight shillings, how many dollars?*

13. In twenty-eight farthings, how many pence? 7

14. How many barrels of flour, at 7 dollars a barrel, can you buy for thirty-four dollars?

15. How many reams of paper, at 5 dollars a ream, can you buy for thirty-seven dollars?

16. In thirty-four gills, how many pints? 8 4

17. In twenty-seven quarts, how many gallons? 7

18. If an orange is worth six apples, how many oranges can you buy for forty apples?

19. Thirty-six shillings are how many dollars?

20. A man bought thirty apples at the rate of 3 for a cent; how many cents did they come to?

21. A labourer engaged to work 8 months for ninety-six dollars; how much did he receive for a month? how much a week, allowing 4 weeks to the month? how many shillings a day, allowing 6 working days to the week?

22. If wine is worth twenty cents a pint, what is 1 gill worth?

23. If you can buy a bushel† of apples for forty cents, what is the price of a peck?

24. If you buy a bushel of pears for forty-eight cents, what will be the price of half a peck, at the same rate?

25. Four men bought a horse for forty-eight dollars; what did each man pay?

26. Five men bought a horse for seventy-five dollars, and sold him again for forty dollars; what did each man lose by the bargain?

27. A man gave sixty-three cents for a horse to ride nine miles; what was the price of one mile's ride?

28. A man hired a horse to ride, and agreed to give 8 cents a mile; he paid fifty-six cents; how many miles did he ride?

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* 1 dollar is 6 shillings. † 1 bushel is 4 pecks.

29. A man had forty-two dollars, which he paid for wood at 7 dollars a cord; how many cords did he buy?

30. Two boys are forty-eight rods apart, and both running the same way; but the hindermost boy gains upon the other 3 rods in a minute; in how many minutes will he overtake the foremost boy?

31. There is a vessel containing sixty-three gallons of wine; it has a pipe which discharges 7 gallons in an hour; how many hours will it take to empty the vessel? 9

32. There is a vessel containing eighty-seven gallons, and by a cock ten gallons will run into it in an hour; in how many hours will the vessel be filled? 8 [illegible]

33. If one man can do a piece of work in thirty days, in how many days can 3 men do it? in how many days can 5 men do it?

34. If you wish to put sixty-four pounds of butter into 8 boxes, how many pounds would you put into each box?

35. If you had seventy-two pounds of butter, which you wished to put into boxes containing 8 pounds each, how many boxes would it take? 9

36. If a man can perform a journey in thirty-six hours, how many days will it take him to do it when the days are nine hours long?

37. If a man can do a piece of work in forty-eight hours, how many days would it take him to do it, if he works twelve hours in a day?

SECTION IV.

A. 1. At two cents a yard, what will 3 yards and one half of a yard of tape cost? 7

2. 3 times 2, and one half of 2 are how many?

3. At 3 dollars a yard, what will 4 yards and 1 third of a yard of cloth cost?

4. 4 times 3, and 1 third of 3 are how many?

5. At 3 dollars a barrel, what will 3 barrels and 2 thirds of a barrel of cider cost? 11

6. 3 times 3, and two thirds of 3 are how many?

7. If a man earn 4 dollars in a week, how many dollars will he earn in 3 weeks and 1 fourth of a week?

8. 3 times 4, and 1 fourth of 4 are how many?

9. If a yard of cloth cost 4 dollars, what will 5 yards and 3 fourths of a yard cost?

10. 5 times 4, and 3 fourths of 4 are how many?

11. If a man spend five dollars in a week, how many dollars will he spend in 3 weeks and 1 fifth of a week? How much in 5 weeks and 2 fifths of a week?

12. 3 times 5, and 1 fifth of 5 are how many?

13. 5 times 5, and 2 fifths of 5 are how many?

14. 6 times 5, and 3 fifths of 5 are how many?

15. If beer is worth six dollars a barrel, what would 4 barrels and 1 sixth of a barrel cost? 25 How much would 7 barrels and 5 sixths of a barrel cost?

16. 4 times 6, and 1 sixth of 6 are how many?

17. 7 times 6, and 5 sixths of 6 are how many?

18. At 7 dollars a barrel, what will 3 barrels and 1 seventh of a barrel of flour cost? What will 5 barrels and 2 sevenths of a barrel cost?

19. 3 times 7, and 1 seventh of 7 are how many?

20. 5 times 7, and 2 sevenths of 7 are how many?

21. 8 times 5, and 4 fifths of 5 are how many ?

22. 8 times 6, and 3 sixths of 6 are how many ?

23. At 8 dollars a yard what will 4 yards and 1 eighth of a yard of broadcloth cost ?

24. 4 times 8, and 1 eighth of 8 are how many ?

25. 2 times 7, and 3 sevenths of 7 are how many ?

26. 8 times 7, and 4 sevenths of 7 are how many ?

27. 9 times 7, and 6 sevenths of 7 are how many ?

28. 3 times 8, and 5 eighths of 8 are how many ?

29. 9 times 8, and 7 eighths of 8 are how many ?

30. If a hundred weight of sugar cost 9 dollars, what will 2 hundred weight and 1 ninth of a hundred weight cost ? What will 5 hundred weight and 2 ninths of a hundred weight cost ?

31. 2 times 9, and 1 ninth of 9 are how many ?

32. 5 times 9, and 2 ninths of are how many ?

33. 6 times 9, and 4 ninths of 9 are how many ?

34. 2 times 10, and 3 tenths of 10 are how many ?

35. 7 times 9, and 7 ninths of 9 are how many ?

36. 5 times 10, and 4 tenths of 10 are how many ?

37. 8 times 9, and 5 ninths of 9 are how many ?

38. 4 times 10, and 7 tenths of 10 are how many ?

39. 6 times 10, and 9 tenths of 10 are how many ?

B. 1. A man bought 2 oranges at 6 cents apiece, how many cents did they come to ? He paid for them with cherries at 4 cents a pint, how many pints did it take ?

2. 2 times 6 are how many times 4 ?

3. A man bought 3 yards of cloth at 4 dollars a yard, how many dollars did it come to ? How much flour at 6 dollars a barrel would it take to pay for it ?

4. 3 times 4 are how many times 6 ?

5. A man bought 4 peaches at 3 cents apiece, how many cents did they come to ? he paid for

them with pears at 2 cents apiece, how many pears did it take ?

6. 4 times 3 are how many times 2 ?

7. Bought 2 hundred weight of sugar, at 9 dollars a hundred weight, and paid for it with wood at 6 dollars a cord ; how many cords did it take ?

8. 2 times 9 are how many times 6 ?

9. Bought 3 barrels of flour at 8 dollars a barrel, and paid for it with cider at 4 dollars a barrel ; how many barrels did it take ?

10. 3 times 8 are how many times 4 ?

11. 12 times 3 are how many times 5 ? 7

12. 6 times 4 are how many times 8 ?

13. 3 times 10 are how many times 6 ? 5

14. 4 times 9 are how many times 6 ?

15. How much flannel worth 4 shillings a yard, must be given for 3 yards of silk worth 5 shillings a yard ?

16. 8 times 5 are how many times 4 ?

17. 2 times 7 are how many times 3 ? 5 ? 4 ?

18. 4 times 5 are how many times 3 ? 6 ? 7 ?

19. 3 times 7 are how many times 4 ? 5 ? 6 ? 8 ? 9 ?

20. Bought 2 kegs and 2 sevenths of a keg of tobacco at 7 dollars a keg, and paid for it with wood at 4 dollars a cord ; how many cords did it take ? How much butter at 3 dollars a box would it take to pay for it ?

21. 2 times 7, and 2 sevenths of 7 are how many times 4 ? 3 ? 5 ? 6 ? 8 ?

22. Bought 3 bushels and 3 fifths of a bushel of corn at 5 shillings a bushel, and paid for it with wheat at 6 shillings a bushel, how many bushels of wheat did it take ?

23. 3 times 5, and 3 fifths of five are how many times 6 ? 9 ? 4 ? 7 ? 3 ? 8 ?

24. How much sugar that is 8 dollars a hundred

weight, can be bought for 4 cords and 2 sevenths of a cord of wood, at 7 dollars a cord?

25. 4 times 7, and 2 sevenths of 7 are how many times 6? 8? 5? 3? 9? 10?

26. 5 times 5, and 3 fifths of 5 are how many times 4? 8? 9? 7? 10? 3? 6?

27. 6 times 7, and 3 sevenths of 7 are how many times 9? 4? 5? 8? 10?

28. 5 times 8, and 3 eighths of 8 are how many times 6? 9? 4? 7? 10?

29. 7 times 8, and 5 eighths of 8 are how many times 9? 6? 10? 4? 5?

30. 5 times 9, and 4 ninths of 9 are how many times 7? 8? 6? 10? 4?

31. 7 times 9, and 7 ninths of 9 are how many times 6? 8? 10? 5? 4?

32. 6 times 10, and 3 tenths of 10 are how many times 7? 5? 4? 9? 8?

33. 8 times 10, and 4 tenths of 10 are how many times 6? 7? 9?

34. 8 times 9, and 3 ninths of 9 are how many times 6? 10? 7?

C. 1. Bought 4 bushels of apples, at 3 shillings a bushel, how many dollars did they come to?

2. How many apples, at 2 cents apiece, must you give for 2 lemons at 4 cents apiece?

3. How many pears, at 3 cents apiece, must you give for 3 oranges at 5 cents apiece?

4. How many barrels of cider, at 3 dollars a barrel, must be given for 5 boxes of butter at 4 dollars a box?

5. A man bought 4 yards of broadcloth, at 7 dollars a yard, and paid for it with flour, at 5 dollars a barrel; how many barrels did he give?

6. If 2 apples cost 4 cents, what would 4 apples cost?

7. If 3 apples are worth 6 cents, how many apples must you give for 8 pears, that are worth 3 cents apiece ?

8. James had 8 oranges that were worth 5 cents apiece, and George had 5 quarts of cherries that were worth 6 cents a quart, which he gave to James for a part of his oranges ; how many oranges did he buy, and how many had James left ?

9. Bought 8 yards of cloth at 9 shillings a yard; how many dollars did it come to ?

10. Bought 5 bushels and 3 sevenths of a bushel of salt, at 7 shillings a bushel, how many dollars did it come to ?

11. Bought 9 boxes and 2 thirds of a box of raisins for 3 dollars a box ; and paid for it with cider at 4 dollars a barrel; how many barrels did it take ?

12. Bought 8 pounds and 4 sevenths of a pound of opium at 7 dollars a pound, and paid for it with cloth at 5 dollars a yard ; how many yards did it take ?

13. Bought 6 chaldrons and 4 ninths of a chaldron of coal at 9 dollars a chaldron, and paid for it with oranges at 5 dollars a box ; how many boxes did it take ?

14. Bought 7 cases and 5 sixths of a case of Florence oil at 6 dollars a case ; and paid for it with sheet lead at 7 dollars a hundred weight; how many hundred weight did it take ?

15. How many dozen of eggs, at 8 cents a dozen, must you give for 7 pounds of sugar, at 10 cents a pound ?

16. How much barley, at 3 shillings a bushel, must be given for 8 bushels of wheat, at 7 shillings a bushel ?

17. How much cloth, at 4 shillings a yard, must be given for a firkin of butter, worth 8 dollars ?

18. How much cloth, at 5 shillings a yard, can be

bought for 2 reams of paper, at 5 dollars a ream?

19. How much wheat, at 7 shillings a bushel, can be bought for 2 barrels of cider, at 4 dollars and a half a barrel?

20. How long would it take a man to lay up 10 dollars, if he saves 4 shillings a day?

21. If a man earn 8 shillings a day, how many dollars would he earn in 10 days?

22. A man bought twenty pears at the rate of 2 for 3 cents; how much did they come to?

23. How many eggs, at the rate of 3 for 5 cents, can you buy for thirty cents?

24. A man hired a labourer and agreed to give him 5 dollars for every 3 days' work; how much did he give him a week, there being 6 working days in a week? How much was it a month, allowing 4 weeks to the month?

25. If a man receives 5 dollars for 3 days' work, how many shillings is that a day?

26. 5 men bought a horse for sixty-three dollars, and paid two dollars a week for keeping him; at the end of 8 weeks they sold him for fifty-four dollars; how much did each man lose by the bargain?

SECTION V.

A. 1. James had 4 apples, and John had half as many, how many had he?

2. If an orange cost 6 cents, and an apple half as much, how much does the apple cost?

3. If you divide 8 apples equally between two boys what part of them must each have?

Google

Ans. One half of them.

4. What is 1 half of 8 ?

5. If you divide 8 apples equally among 4 boys, what part of them must each have ?

Ans. One fourth of them.

6. What is 1 fourth of 8 ?

7. If you divide 6 oranges equally among 3 boys, what part of them must 1 boy have ?

8. What is 1 third of 6 ?

9. If 4 yards of cloth cost 8 dollars, what part of 8 dollars would 1 yard cost ? What part of 8 dollars would 2 yards cost ? What part of 8 dollars would 3 yards cost ?

10. What is 1 fourth of 8 ? What is 2 fourths of 8 ? What is 3 fourths of 8 ?

11. If 6 yards of cloth will make 3 coats, what part of 6 yards will make 1 coat ? What part of 6 yards will make 2 coats ?

12. What is 1 third of 6 ? What is two thirds of 6 ?

13. If 3 barrels of cider cost 9 dollars, what part of 9 dollars will 1 barrel cost ? What part of 9 dollars will 2 barrels cost ?

14. What is 1 third of 9 ? What is 2 thirds of 9 ?

15. If 2 yards of cloth cost 10 dollars, what part of 10 dollars will 1 yard cost ? What part of 10 dollars will 3 yards cost ?

16. What is 1 half of 10 ? What is 3 halves of 10 ?

17. If 2 barrels of flour cost twelve dollars, what part of twelve dollars will one barrel cost ? What part of twelve dollars will 3 barrels cost ? What part of twelve dollars will 5 barrels cost ?

18. What is 1 half of twelve ? What is 3 halves of 12 ? What is 5 halves of twelve ?

19. If 4 barrels of cider cost twelve dollars, what part of twelve dollars will 1 barrel cost ? What part of twelve dollars will 3 barrels cost ? What

part of twelve dollars will 5 barrels cost? What part of twelve dollars will 7 barrels cost?

20. What is 1 fourth of twelve? What is 2 fourths of twelve? 3 fourths? 5 fourths? 7 fourths?

21. If 3 oranges cost twelve cents, what part of twelve cents will 1 orange cost? What part of twelve cents will 2 oranges cost? What part of twelve cents will 4 oranges cost? What part of twelve cents will 5 oranges cost? 7 oranges? 10 oranges?

22. What is 1 third of twelve? 2 thirds? 4 thirds? 5 thirds? 7 thirds? 10 thirds?

23. If 5 bushels of wheat cost 10 dollars, what part of 10 dollars will 1 bushel cost? What part of 10 dollars will 2 bushels cost? 3 bushels? 4 bushels? 6 bushels? 7 bushels?

24. What is 1 fifth of 10? 2 fifths? 3 fifths? 4 fifths? 6 fifths? 7 fifths?

25. What is 1 half of fourteen? 1 seventh? 2 sevenths? 3 sevenths? 5 sevenths?

26. What is 1 third of fifteen? 2 thirds? 1 fifth? 2 fifths? 3 fifths? 4 fifths?

27. What is 1 half of sixteen? 3 fourths? 1 eighth? 3 eighths? 5 eighths? 7 eighths? 1 sixteenth?

28. What is 1 half of eighteen? 2 thirds? 1 sixth? 5 sixths? 1 ninth? 2 ninths? 4 ninths? 5 ninths? 7 ninths? 8 ninths? 1 eighteenth? 5 eighteenths?

29. What is 1 half of twenty? 1 fourth? 3 fourths? 1 fifth? 3 fifths? 2 fifths? 4 fifths? 1 twentieth? 3 twentieths? 7 twentieths?

30. What is 1 third of twenty-one? 2 thirds? 1 seventh? 5 sevenths? 3 sevenths? 6 sevenths? 4 sevenths?

31. What is 1 half of twenty-two? 1 eleventh? 3 elevenths? 5 elevenths? 7 elevenths? 10 elevenths?

32. What is 1 half of twenty-four? 1 third? 2 thirds? 1 fourth? 3 fourths? 1 sixth? 5 sixths? 1

eighth? 3 eighths? 7 eighths? 1 twelfth? 5 twelfths? 7 twelfths?

33. What is 1 half of twenty-six?

34. What are 2 thirds of twenty-seven? 2 ninths? 4 ninths? 5 ninths? 8 ninths? 7 ninths?

35. What is 1 half of twenty-eight? 3 fourths? 2 sevenths? 5 sevenths? 3 sevenths?

36. What is 1 sixth of thirty? 3 fifths? 7 tenths? 2 thirds? 1 half?

37. What is 1 half of thirty-two? 3 fourths? 5 eighths? 1 sixteenth?

38. What is 1 half of thirty-four?

39. What is 5 sixths of thirty-six? 2 thirds? 1 half? 7 twelfths? 4 ninths? 3 fourths?

40. What is 1 half of thirty-eight?

41. What is 1 third of thirty-nine?

42. What is 3 fourths of forty? 7 eighths? 9 tenths? 1 half?

43. What is 3 sevenths of forty-two? 5 sixths?

B. 1. A boy having twelve apples, kept 1 fourth of them himself, and divided the other 3 fourths of them equally among 4 of his companions, how many did he give them apiece?

2. 3 fourths of twelve are how many times 4?

3. A man having fourteen bushels of grain, divided 5 sevenths of it equally among 3 men; how much did he give them apiece?

4. 5 sevenths of fourteen are how many times 3?

5. A man having fifteen shillings, gave away 4 fifths of it, how many dollars did he give away?

6. 4 fifths of fifteen are how many times 6?

7. A man having twenty-one cents, paid away 6 sevenths of them for oranges at 5 cents apiece; how many oranges did he buy?

8. 6 sevenths of twenty-one are how many times 5?

9. A man bought a piece of cloth for twenty-four shillings, and sold it again for 5 thirds of what he gave for it; how many dollars did he sell it for ?

10. 5 thirds of twenty-four are how many times 6 ?

11. 7 fifths of twenty are how many times 6 ?

12. 5 sevenths of thirty-five are how many times 8 ?

13. 7 sixths of thirty-six are how many times 5 ?

14. 9 sevenths of forty-two are how many times 8 ?

15. 7 ninths of forty-five are how many times 6 ? 5 5

16. 5 sixths of forty-eight are how many times 7 ?

17. 6 fifths of fifty are how many times 9 ?

18. 8 ninths of fifty-four are how many times 5 ?

19. 9 sevenths of fifty-six are how many times 10 ?

20. 7 sixths of sixty are how many times 8 ?

21. 9 sevenths of sixty-three are how many times 7 ?

22. 10 eighths of sixty-four are how many times 9 ?

23. 6 eighths of seventy-two are how many times 7 ?

24. 4 sevenths of eighty-four are how many times 9 ?

25. 7 tenths of ninety are how many times 8 ?

C. 1. Charles had 6 apples, and gave 1 third of them to John; how many did he give him ?

2. Albert had 9 cents, and spent 2 thirds of them; how many had he left ?

3. James had 10 pears, and gave 1 half of them to one of his companions, and 2 fifths of them to another; how many did he give away ?

4. If 3 yards of cloth cost 6 dollars, what is that a yard ?

5. If 4 yards of cloth cost twelve dollars, what will 2 yards cost?

6. If 9 apples cost eighteen cents, what will 3 apples cost?

7. If 3 oranges cost 18 cents, what will 2 cost?

8. James had twenty-five cents, and he gave 4 fifths of them for 10 apples; how much did he give for all the apples? how much apiece?

9. A man had thirty dollars, and gave 5 sixths of them for 8 yards of cloth; how much did he give a yard?

10. A man had forty yards of cloth, and sold 3 fifths of it for twenty-four dollars; what was that a yard?

11. A man had forty-two barrels of flour, and sold 2 sevenths of it for 6 dollars a barrel; how much did it come to?

12. A boy had sixty-three nuts, and divided 4 sevenths of them equally among six of his companions; how many did he give them apiece?

13. If 4 yards of cloth cost twelve dollars, what will 3 yards cost?

14. If 5 oranges cost twenty-five cents, what will 3 cost?

15. If 3 oranges cost fifteen cents, what will 7 cost?

16. If 3 barrels of cider cost twelve dollars, what will 10 barrels cost?

17. If 7 pounds of flour cost thirty-five cents, what will 9 pounds cost?

18. If 5 firkins of butter cost forty dollars, what will 3 firkins cost?

19. If 2 men can do a piece of work in 6 days, how long would it take 4 men to do the same work?

20. If 6 men can do a piece of work in twelve days, in how many days will 3 men do the same work?

21. If 3 men can do a piece of work in twelve days, in how many days will 4 men do the same work? 9

22. If 2 cocks of a certain size will empty a cistern in 6 hours, in how long a time will 3 cocks of the same size empty it?

23. Three men, setting out on a journey, purchased 5 loaves of bread apiece, but before they had eaten any of it, two other men joined them, and they agreed to share the bread equally among the whole; how many loaves did they have apiece? 3

24. If 4 barrels of flour cost twenty-four dollars, what would 7 barrels cost? How much cider at 3 dollars a barrel would 7 barrels of flour buy? 14 42

25. A man bought a quantity of flour for fifty-four dollars; and another man gave him 9 yards of cloth for 5 sixths of it; what was the cloth worth a yard? 5

26. If 9 yards of cloth cost fifty-four dollars, how many boxes of butter at 4 dollars a box, would 5 yards of the same cloth buy?

27. Bought 8 firkins of butter for seventy-two dollars, and gave 6 of them for 7 yards of cloth; what was a yard of the cloth worth?

28. A man bought 6 barrels of flour for sixty dollars, and gave 4 barrels of it for cider at 5 dollars a barrel; how many barrels did he buy? 8

Note. The manner of writing numbers with figures has been explained as far as ten. The numbers from ten to one hundred are written as follows:

Ten is written	10
Eleven	11
Twelve	12
Thirteen	13
Fourteen	14
Fifteen	15
Sixteen	16
Seventeen	17

Eighteen	18
Nineteen	19
Twenty	20
Twenty-one	21
Twenty-two	22
Twenty-three	23
Twenty-four	24
Twenty-five	25
Twenty-six	26
Twenty-seven	27
Twenty-eight	28
Twenty-nine	29
Thirty	30
Thirty-one, &c.	31
Forty	40
Fifty	50
Sixty	60
Seventy	70
Eighty	80
Ninety	90
One hundred	100

SECTION VI.

A. 1. Bought 1 half of a yard of cloth for 1 shilling, what would be the price of a yard at the same rate ?

2. If 1 half pint of cherries cost 2 cents, what will a pint cost ?

3. If 1 fourth of a barrel of flour cost 2 dollars, what would a barrel cost ?

4. 2 is 1 half of what number ? 1 fourth of what number ?

5. If 1 third of a yard of cloth cost 2 dollars, what is that a yard?

6. 2 is 1 third of what number? 6

7. If 1 third of a yard of cloth cost 3 dollars, what is that a yard?

8. 3 is 1 third of what number? 9

9. If 1 fourth of a firkin of butter cost 3 dollars, what is that a firkin? 12

10. 3 is 1 fourth of what number?

11. A man bought 1 third of a bushel of wheat for 4 shillings, what would a bushel cost at that rate?

12. 4 is 1 third of what number? 12

13. If a man can ride 2 miles in 1 fifth of an hour, how far can he ride in an hour? 10

14. 2 is 1 fifth of what number?

15. A man being asked the age of his eldest son, answered that his youngest son who was 3 years old, was just 1 fifth of the age of his eldest son; how old was the eldest son?

16. 3 is 1 fifth of what number?

17. A man bought 1 sixth part of a hundred weight of sugar for 2 dollars, what would a hundred weight cost at the same rate?

18. 2 is 1 sixth of what number? 12

19. Bought 1 fifth of a pound of starch for 5 cents, what was that a pound?

20. 5 is 1 fifth of what number?

21. Bought 1 fourth of a pound of aquafortis for 6 cents, what was that a pound?

22. 6 is 1 fourth of what number?

23. Bought 1 seventh of a hundred weight of cocoa for 4 dollars, what would 1 hundred weight cost at the same rate?

24. 4 is 1 seventh of what number?

25. 7 is 1 fifth of what number?

26. 5 is 1 third of what number?

27. 4 is 1 eighth of what number?
28. 6 is 1 sixth of what number?
29. 8 is 1 third of what number?
30. 9 is 1 fourth of what number?
31. 7 is 1 sixth of what number?
32. 8 is 1 seventh of what number?
33. 9 is 1 eighth of what number?
34. 8 is 1 tenth of what number?
35. 7 is 1 ninth of what number?
36. 6 is 1 fifth of what number?
37. 10 is 1 seventh of what number?

B. 1. A man bought some linen and some cotton cloth, for the linen he gave 4 shillings a yard, which was twice as much as he gave for the cotton; what did he give for a yard of the cotton?

2. 4 is 2 times what number?

3. If 2 thirds of a yard of cloth cost 6 dollars, what would 1 third cost?

4. 6 is 2 times what number?

5. If 3 fourths of a barrel of flour cost 6 dollars, what will one fourth of a barrel cost?

6. 6 is three times what number?

7. If 2 fifths of a pound of chocolate cost 8 cents, what would 1 fifth of a pound cost?

8. 8 is 2 times what number?

9. If 3 fifths of a pound of candles cost 9 cents, what will 1 fifth of a pound cost?

10. 9 is 3 times what number?

11. If 2 sevenths of a pound of spermaceti candles cost 10 cents, what will 1 seventh of a pound cost?

12. 10 is 2 times what number?

13. If 5 eighths of a pound of cotton cost 10 cents, what will 1 eighth cost?

14. 10 is 5 times what number?

15. If 2 thirds of a yard of cloth cost 4 dollars,

what will 1 third cost ? If 1 third of a yard cost 2 dollars, what will a yard cost ?*

16. If 4 is 2 thirds of some number, what is 1 third of the same number ? 2 is 1 third of what number ?*—Then 4 is 2 thirds of what ? 6

17. If 2 thirds of a barrel of flour cost 6 dollars, what will 1 third of a barrel cost ? If 1 third of a barrel cost 3 dollars, what will a barrel cost ?*

18. If 6 is 2 thirds of some number, what is 1 third of the same number ?—3 is 1 third of what number ?—Then 6 is 2 thirds of what ? 9

19. If 3 fourths of a bushel of wheat cost 6 shillings, what will 1 fourth of a bushel cost ? If 1 fourth of a bushel cost 2 shillings, what will a bushel cost ? 8

20. If 6 is 3 fourths of some number, what is 1 fourth of the same number ?—2 is 1 fourth of what number ?—Then 6 is 3 fourths of what ?

21. If 2 fifths of a gallon of wine cost 4 shillings, what will 1 fifth of a gallon cost ? If 1 fifth of a gallon cost 2 shillings, what will a gallon cost ?

22. If 4 is 2 fifths of some number, what is 1 fifth of the same number ? 2 is 1 fifth of what number ? —Then 4 is 2 fifths of what ?

23. If 3 sevenths of a pound of tobacco cost 6 cents, what will 1 seventh of a pound cost ? If 1 seventh of a pound cost 2 cents, what will a pound cost ?

24. If 6 is 3 sevenths of some number, what is 1 seventh of the same number ?—2 is 1 seventh of what number ?—Then 6 is 3 sevenths of what ?

25. If 2 sevenths of a barrel of fish cost 4 dollars, what will 1 seventh of a barrel cost ? What will a barrel cost ?

26. 4 is 2 sevenths of what number ?

27. If 3 eighths of a pound of chocolate cost 6

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* See this section, article A.

cents, what will 1 eighth of a pound cost? What will a pound cost? 16

28. 6 is 3 eighths of what number? 16

29. If eight cents will buy 2 fifths of a pound of aquafortis, how many cents will buy a pound?

30. 8 is 2 fifths of what number? 20

31. A man bought 3 fourths of a hundred weight of yellow ochre for 9 dollars; what was that a hundred weight? 12

32. 9 is three fourths of what number? 12

33. 8 is 4 ninths of what number? 18

34. 9 is 3 tenths of what number? 30

35. 10 is 5 sevenths of what number? 4

36. 12 is 3 fifths of what number? 20

37. 12 is 4 ninths of what number?

38. 10 is 2 sevenths of what number?

39. 14 is 7 fifths of what number?

40. 15 is 3 elevenths of what number?

41. 16 is 2 fifths of what number?

42. 18 is 6 tenths of what number?

43. 20 is 5 ninths of what number?

44. 21 is 3 ninths of what number?

45. 24 is 8 ninths of what number? 27

C. 1. If 5 eighths of a cask of claret wine cost 15 dollars, what is that a cask? 24 How much cider at 4 dollars a barrel would it take to pay for a cask of the wine? 6

2. 15 is five eighths of how many times 4? 6

3. If 2 thirds of a pound of coffee cost 18 cents, how much would a pound cost? 2 How many oranges at 5 cents apiece, might be bought for a pound? 5

4. 18 is 2 thirds of how many times 5?

5. A man bought 4 sevenths of a hundred weight of sugar for 20 shillings, how many dollars would a hundred weight come to at the same rate?

6. 20 is 4 sevenths of how many times 6?

7. A man sold a cow for 21 dollars, which was only seven tenths of what she cost him; how much did she cost him? 30 When he bought her, he paid for her with cloth at 8 dollars a yard; how many yards of cloth did he give? 3 3/4

8. 21 is 7 tenths of how many times 8?

9. A man being asked the age of his youngest son, answered, that the age of his eldest son was 24 years, which was 3 fifths of his own age; and that his own age was 10 times as much as that of his youngest son; what was his age? and what was the age of his youngest son? 40. 4.

10. 24 is 3 fifths of how many times 10?
11. 27 is 3 fifths of how many times 7? 7 times
12. 28 is 7 tenths of how many times 9?
13. 30 is 5 eighths of how many times 7?
14. 32 is 4 sevenths of how many times 6?
15. 36 is 9 eighths of how many times 5?
16. 40 is 8 ninths of how many times 8?
17. 42 is 6 fifths of how many times 4?
18. 45 is 9 eighths of how many times 6?
19. 48 is 8 ninths of how many times 7?
20. 50 is 5 sevenths of how many times 8?
21. 54 is 9 sixths of how many times 7?
22. 56 is 7 ninths of how many times 10?
23. 40 is 10 sevenths of how many times 4?
24. 63 is 9 eighths of how many times 5?
25. 64 is 8 ninths of how many times 7?
26. 70 is 10 sevenths of how many times 8?
27. 72 is 9 fifths of how many times 6?
28. 80 is 10 thirds of how many times 4?
29. 80 is 8 fifths of how many times 6?

D. 1. A boy gave away 4 cents, which was 1 third of all he had; how many had he at first?

2. A boy gave 5 apples to one of his companions,

which was 1 fourth of what he had; how many had he?

3. A man paid away 4 dollars, which was 2 thirds of all the money he had; how much had he?

4. A man sold a watch for 18 dollars, which was 3 fourths of what it cost him; how much did it cost?

5. A man sold a cow for 15 dollars, which was 3 fifths of what the cow cost; how much did he lose by his bargain?

6. A man bought 12 yards of cloth, and sold it for 54 dollars, which was 9 eighths of what it cost him; what did it cost him a yard? and how much did he gain by his bargain?

7. There is a pole standing in the water, so that 10 feet of it is above the water, which is 2 thirds of the whole length of the pole; how long is the pole?

8. There is a pole two thirds under water, and 4 feet out; how long is the pole?

9. There is a pole two fifths under water, and 6 feet out of the water; how long is the pole?

10. There is an orchard, in which 3 sevenths of the trees bear cherries, and 2 sevenths bear peaches, and 10 trees bear plums; how many trees are there in the orchard? and how many of each sort?

11. There is a school, in which 2 ninths of the boys learn arithmetic, 3 ninths learn grammar, 1 ninth learn geography, 1 ninth learn geometry, and 12 learn to write; how many are there in the school? and how many attending to each study?

12. A man sold a watch for 63 dollars, which was 7 fifths of what it cost him; how much did he gain by the bargain?

Miscellaneous Examples.

1. If 1 yard of cloth cost 4 dollars, what will 5 yards cost?

2. A man bought 3 pounds of raisins, at 7 cents a pound, and 16 oranges, at 4 cents apiece, and 1 pound of candles for 16 cents; what did they all come to?

3. A boy had 37 apples; he kept five himself, and divided the rest equally among four companions; how many did he give them apiece? 8

4. Two men are 40 miles apart, and both travelling the same way; the hindermost man gains upon the other 5 miles each day; in how many days will he overtake him? 8

5. Two men are travelling the same way, one travels at the rate of 38 miles a day, the other, who is behind the former, travels 44 miles; how much does he gain of the first each day? and in how many days would he gain 60 miles?

6. A fox is 80 rods before a greyhound, and is running at the rate of 27 rods in a minute, the greyhound is following at the rate of 31 rods in a minute; in how many minutes will the greyhound overtake the fox?

7. If 2 yards of cloth cost 6 dollars, what would 4 yards cost? what would 12 yards cost?

8. If 8 sheep cost 24 dollars, what would 3 cost?

9. If 4 tons of hay will keep 3 horses through the winter, how many tons will keep 30 horses the same time?

10. If a man spends 8 shillings a day, how many dollars will he spend in a week?

11. Bought 10 pieces of cloth, each containing 5 yards, for 100 dollars; what was it apiece? and how much a yard?

12. If the wages of 12 weeks come to 60 dollars, what is that a month? and how much for 5 weeks?

13. If 7 horses eat 14 bushels of oats in 1 week, how many bushels would 15 horses eat in the same time?

14. If 3 horses eat 8 bushels of oats in 2 weeks, how long would it take them to eat 40 bushels? 10

15. If 1 horse eat 1 bushel of oats in 3 days, in how many days would 4 horses eat 36 bushels?

16. If 2 men spend 12 dollars in 1 week, how many dollars would 3 men, at the same rate, spend in 5 weeks?

17. If a staff 3 feet long cast a shadow of 2 feet at 12 o'clock, what is the length of a pole that casts a shadow 18 feet at the same time of day?

18. If 47 gallons of water, in 1 hour, run into a cistern containing 108 gallons, and by a pipe 38 gallons run out in an hour, how much remains in the cistern in an hour? and in how many hours will the cistern be filled?

19. If 4 men can do a piece of work in 8 days, how many men would it take to do the same work in 4 days?

20. If 6 men can do a piece of work in 9 days, in how many days would 2 men do it?

21. If 8 men can do a piece of work in 5 days, in how many days would they do a piece of work 4 times as large?

22. If 7 men can do a piece of work in 3 days, how many men would it take to do a piece of work 5 times as large in the same time?

23. If 8 men can do a piece of work in 4 days, in how many days would 2 men do a piece of work one half as large?

24. A man bought a cask of wine containing 63 gallons, 3 sevenths of which leaked out; and he

sold the remainder for 36 dollars; how much per gallon did he sell it for?

25. If a cask of wine cost 48 dollars, what is 5 eighths of it worth? 30

26. A man bought 7 oranges for 6 cents apiece, and sold them all for 54 cents, how much did he gain by the bargain?

27. A man bought 8 yards of cloth for 56 dollars, and sold it again for 9 dollars a yard; how much did he gain by the bargain?

28. A man bought 8 barrels of flour for 40 dollars; how much must he sell it at per barrel to gain 16 dollars?

29. A man bought five firkins of butter at 7 dollars a firkin; how much must he sell it per firkin to gain 10 dollars?

30. A man gave 35 cents for his breakfast, which was 5 eighths of what he gave for his dinner; what did he give for his dinner?

31. A ship's crew of 6 men have provision for 3 months; how many months would it last 1 man?

32. A ship's crew have provision sufficient to last 1 man 27 months; how long would it last 9 men?

33. A ship's crew have provision sufficient to last 3 men 10 months; how long would it last 5 men?

34. A man built 40 rods of wall in a certain time, another man can build 9 rods while the first build 5; how much would he build in the same time?

SECTION VII.

If the combinations in this section should be found too difficult, they may be omitted until reviewing the book.

A. 1. A MAN being asked the age of his eldest son answered, that his youngest son was six years old, and that 2 thirds of the youngest son's age was just 1 fifth of the eldest son's age. Required the age of the eldest son?

2. 2 thirds of 6 is 1 fifth of what number?

3. A man being asked how many sheep he had, said that he had them in two pastures; in one pasture he had eight; and that 3 fourths of these was just 1 third of what he had in the other. How many were there in the other? 18

4. 3 fourths of 8 is 1 third of what number? 18

5. Two boys talking of their ages, one said he was 9 years old. Well, said the other, 2 thirds of your age is exactly 3 fourths of my age, now if you will tell me how old I am, I will give you as many apples as I am years old. What was his age?

6. 2 thirds of 9 is 3 fourths of what number?

7. Two boys counting their money, one said he had ten cents. The other says, 4 fifths of your money is exactly 2 sevenths of mine; now if you will tell how many I have, I will give you 1 half of them. How many had he? 28

8. 4 fifths of 10 is 2 sevenths of what number? 28

9. 5 sixths of 12 is 2 thirds of what number? 15

10. 6 sevenths of 14 is 4 ninths of what number? 27

11. 6 fifths of 15 is 2 thirds of what number? 27

12. 7 ninths of 18 is 2 fifths of what number? 35

13. 4 fifths of 20 is 8 sevenths of what number? 14

14. 8 sevenths of 21 is 6 tenths of what number? 40

15. 5 sixths of 24 is 10 sevenths of how many times 5?

16. 3 sevenths of 28 is 2 eighths of how many times 7?

17. 4 fifths of 30 is 6 sevenths of how many times 8?

18. 6 eighths of 32 is 8 ninths of how many times 5?

19. 4 ninths of 36 is 8 tenths of how many times 6?

20. 3 fourths of 40 is 5 sevenths of how many times 8?

21. 6 ninths of 45 is 3 fifths of how many times 7?

22. 5 sixths of 48 is 10 sevenths of how many times 3?

23. 4 sevenths of 63 is 6 fifths of how many times 8?

24. 5 ninths of 72 is 4 sevenths of how many times 9?

B. 1. 4 fifths of 15 is 6 tenths of how many thirds of 21?

2. 4 thirds of 18 is 8 ninths of how many sevenths of 35?

3. 6 sevenths of 21 is 2 thirds of how many thirds of 24?

4. 5 fourths of 24 is 10 sevenths of how many fifths of 40.

5. 5 eighths of 32 is 2 fifths of how many fifths of 35?

6. 4 sevenths of 63 is 6 eighths of how many ninths of 45?

7. 3 sevenths of 56 is 4 ninths of how many fourths of 28?

8. 3 eighths of 64 is 6 tenths of how many sixths of 30?

9. 2 eighths of 72 is 3 tenths of how many fifths of 40?

C. 1. Two times eleven are how many?

2. Two times twelve are how many?

3. Two times thirteen are how many?

4. Two times fourteen are how many?

5. Two times fifteen are how many?

6. Two times sixteen are how many ?
7. Two times seventeen are how many ?
8. Two times eighteen are how many ?
9. Two times nineteen are how many ?
10. Two times twenty are how many ?
11. Three times eleven are how many ?
12. Three times twelve are how many ?
13. Three times thirteen are how many ?
14. Three times fourteen are how many ?
15. Three times fifteen are how many ?
16. Three times sixteen are how many ?
17. Three times seventeen are how many ?
18. Three times eighteen are how many ?
19. Three times nineteen are how many ?
20. Three times twenty are how many ?
21. Four times eleven are how many ?
22. Four times twelve are how many ?
23. Four times thirteen are how many ?
24. Four times fourteen are how many ?
25. Four times fifteen are how many ?
26. Four times sixteen are how many ?
27. Four times seventeen are how many ?
28. Four times eighteen are how many ?
29. Four times nineteen are how many ?
30. Four times twenty are how many ?
31. Five times eleven are how many ?
32. Five times twelve are how many ?
33. Five times thirteen are how many ?
34. Five times fourteen are how many ?
35. Five times fifteen are how many ?
36. Five times sixteen are how many ?
37. Five times seventeen are how many
38. Five times eighteen are how many ?
39. Five times nineteen are how many ?
40. Five times twenty are how many ?
41. Six times eleven are how many ?
42. Six times twelve are how many ?

43. Six times thirteen are how many?
44. Six times fourteen are how many?
45. Six times fifteen are how many?
46. Six times sixteen are how many?
47. Six times seventeen are how many?
48. Six times eighteen are how many?
49. Six times nineteen are how many?
50. Six times twenty are how many?
51. Seven times eleven are how many?
52. Seven times twelve are how many?
53. Seven times thirteen are how many?
54. Seven times fourteen are how many?
55. Seven times fifteen are how many?
56. Seven times sixteen are how many?
57. Seven times seventeen are how many?
58. Seven times eighteen are how many?
59. Seven times nineteen are how many?
60. Seven times twenty are how many?
61. Eight times eleven are how many?
62. Eight times twelve are how many?
63. Eight times thirteen are how many?
64. Eight times fourteen are how many?
65. Eight times fifteen are how many?
66. Eight times sixteen are how many?
67. Eight times seventeen are how many?
68. Eight times eighteen are how many?
69. Eight times nineteen are how many?
70. Eight times twenty are how many?
71. Nine times eleven are how many?
72. Nine times twelve are how many?
73. Nine times thirteen are how many?
74. Nine times fourteen are how many?
75. Nine times fifteen are how many?
76. Nine times sixteen are how many?
77. Nine times seventeen are how many
78. Nine times eighteen are how many?
79. Nine times nineteen are how many?

80. Nine times twenty are how many?
81. Ten times eleven are how many?
82. Ten times twelve are how many?
83. Ten times thirteen are how many?
84. Ten times fourteen are how many?
85. Ten times fifteen are how many?
86. Ten times sixteen are how many?
87. Ten times seventeen are how many?
88. Ten times eighteen are how many?
89. Ten times nineteen are how many?
90. Ten times twenty are how many?

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SECTION VIII.

A. 1. If you cut an apple into two equal parts, what is one of those parts called?*

2. How many halves of an apple will make the whole apple?

3. If you cut an apple into 3 equal parts, what is 1 of those parts called? what are 2 of the parts called?

4. How many thirds of an apple will make the whole apple?

5. If you cut an apple into 4 equal parts, what is 1 of those parts called? what are 2 of those parts called? what are 3 of them called?

6. How many fourths of an apple make the whole apple?

7. If an apple be cut into 5 equal parts, what is one of the parts called? what are 2 of the parts called? what are 3 of the parts called? what are 4 of the parts called?

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* See Section III, article B, remark before question 1 and 17.

8. How many fifths of an apple make the whole apple?

9. If an apple be cut into 6 equal parts, what is 1 of the parts called? what are 2 of the parts called? what 3? what 4? what 5?

10. How many sixths of an apple make the whole apple?

11. If an apple be cut into 7 equal parts, what is 1 of the parts called? what are 2 of the parts called? what 3? what 4? what 5? what 6?

Let the instructer ask the pupil the divisions of a unit in this manner as far as the division into 10 *parts. It would be well to ask them further. Then let him begin again, and suppose an orange instead of an apple. After applying the division to several different things, Plate II. may be explained and used. It will often be found useful to refer the pupil to the divisions of some sensible object. For the explanation of Plate II. see the Key.*

12. A man had a bushel of corn and wished to give 1 half of a bushel apiece to some labourers; how many could he give it to?

13. How many halves are there in 1?

14. A man divided 2 barrels of flour among his labourers giving them 1 half of a barrel apiece, how many men did he give it to?

15 How many halves are there in 2?*

16. In 3 bushels of corn how many half bushels?

17. How many halves are there in 3?

18. A boy divided 4 oranges among his companions, giving them 1 half of an orange apiece; how many boys did he give them to?

19. How many halves are there in 4?

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* Be careful to make the pupil use the plate. He might answer the questions without, but he will not understand their meaning so well.

20. A man having some labourers gave them 1 half a dollar apiece; it took 3 dollars and 1 half a dollar to pay them; how many labourers were there?

21. How many halves are there in 3 and 1 half?

22 How many halves are there in 5? 10

23 How many halves are there in 7 and 1 half? 15

24. How can you tell how many halves there are in any number?

Answer. Since there are 2 halves in one, there will be twice as many halves as there are whole ones.

25. If you had 1 orange, and should divide it among your companions giving them 1 third apiece, how many could you give it to? 3

26. How many thirds are there in 1?

27. If you cut 2 oranges each into 3 pieces, how many pieces would they make? 6

28. If you cut 3 oranges into 3 pieces each, how many pieces would they make? 9

29. If you cut 4 apples each into 3 pieces, how many pieces would they make? 12

30. How many thirds are there in 2? in 3? in 4? in 5? 12

31. How can you tell how many thirds there are in any number?

Answer. Since there are 3 thirds in one, there will be 3 times as many thirds as there are whole ones.

32. If you had 2 bushels and 1 third of a bushel of corn to give to some poor persons, how many could you give it to if you should give them 1 third of a bushel apiece? 7

33. How many thirds are there in 2 and 1 third?

34. If a horse can eat 1 third of a bushel of oats in 1 day, how many days would it take him to eat 3 bushels and 2 thirds of a bushel? 11

35. How many thirds are there in 3 and 2 thirds?

36. If 1 horse can eat 1 third of a bushel of oats in a day, how many horses will it take to eat 5 bushels and 2 thirds of a bushel in the same time? 17

37. In 5 and 2 thirds how many thirds?

38. In seven and 1 third how many thirds?

39. If 1 horse will eat 1 fourth of a ton of hay in 1 month, how many horses will eat a ton in the same time? 4 How many will eat 2 tons? How many will eat 3 tons? 4 tons? 5 tons? 6 tons?

40. How many fourths are there in 1? in 2? in 3? in 4? in 5? in 6?

41. How can you tell how many fourths there are in any number?

42. How many fourths are there in 4 and 1 fourth?

43. In 5 tons of hay and 3 fourths of a ton how many fourths of a ton?

44. In 5 and 3 fourths how many fourths?

45. In 7 and 1 fourth how many fourths?

46. In 9 and 3 fourths how many fourths?

47. If a horse eat 1 fifth of a ton of hay in a month, how many horses will eat a ton in the same time? 2 tons? 3 tons? 4 tons? 5 tons?

48. How many fifths are there in 1? in 2? in 3? in 4? in 5? in 7? in 9?

49. How can you tell how many fifths there are in any number?

50. In 2 and 1 fifth how many fifths?

51. In 3 dollars and 2 fifths of a dollar how many fifths of a dollar?

52. In 3 and 2 fifths how many fifths?

53. In 5 and 3 fifths how many fifths?

54. In 6 and 4 fifths how many fifths?

55. How many sixths are there in 1? in 2? in 3? in 4? in 5? in 7? in 8?

56. In 2 and 2 sixths how many sixths?

57. In 3 and 4 sixths how many sixths?

58. In 6 and 5 sixths how many sixths?

59. How many sevenths are there in 1? in 2? in 3? in 4? in 6? in 9? in 10?

60. In 3 and 1 seventh how many sevenths?

61. In 5 and 3 sevenths how many sevenths?

62. In 7 and 5 sevenths how many sevenths?

63. How many eighths are there in 1? in 3? in 5? in 8?

64. In 2 and 3 eighths how many eighths?

65. In 3 and 5 eighths how many eighths?

66. In 5 and 7 eighths how many eighths?

67. How many ninths are there in 1? in 2? in 7? in 5?

68. In 2 and 2 ninths how many ninths?

69. In 4 and 3 ninths how many ninths?

70. In 6 and 4 ninths how many ninths?

71. In 8 and seven ninths how many ninths?

72. How many tenths in 1? in 2? in 5? in 8?

73. In 3 and 3 tenths how many tenths? 33

74. In 4 and 7 tenths how many tenths?

75. In 8 and 9 tenths how many tenths?

76. In 7 and 4 tenths how many tenths?

77. In 9 and 8 tenths how many tenths?

78. In 7 and 4 sevenths how many sevenths? 53

79. In 9 and 2 thirds how many thirds?

80. In 10 and 3 fourths how many fourths?

81. In 8 and 4 fifths how many fifths?

82. In seven and 5 ninths how many ninths? 68

B. 1. If you give 4 men 1 half of a barrel of flour apiece, how many barrels will it take?

2. In 4 halves how many times 1?

3. If you give 3 boys 1 half of an orange apiece, how many oranges will it take?

4. In 3 halves how many times 1?

5. If you give five men 1 half of a dollar apiece, how many dollars will it take?

6. In five halves how many times 1?

7. In 6 halves how many times 1? 3

8. In 7 halves how many times 1?

9. How can you tell how many whole ones there are in any number of halves?

10. A man divided some corn among 6 persons, giving them 1 third of a bushel apiece; how many bushels did it take?

11. In 6 thirds how many times 1?

12. In 5 thirds how many times 1?

13. A man gave eight paupers 1 third of a dollar a piece, how many dollars did it take?

14. In 8 thirds how many times 1?

15. In 10 thirds how many times 1?

16. How can you tell how many whole ones there are in any number of thirds?

17. If a man spends 1 fourth of a dollar in one day, how many dollars will he spend in 8 days? How many in 7 days? How many in 11 days?

18. In 8 fourths how many times 1?

19. In 7 fourths how many times 1?

20. In 11 fourths how many times 1?

21. In 13 fourths how many times 1?

22. In 18 fourths how many times 1?

23. How can you tell how many whole ones there are in any number of fourths?

24. If 1 fifth of a barrel of beer will last a family 1 day, how many barrels will last them 10 days? How many 8 days? 11 days? 17 days?

25. In 10 fifths how many times 1?

26. In 8 fifths how many times 1?

27. In 11 fifths how many times 1?

28. In 17 fifths how many times 1?

29. In 18 sixths how many times 1?

30. In 23 fifths how many times 1?

31. In 21 sevenths how many times 1?

32. In 24 eighths how many times 1?

33. In 36 ninths how many times 1?

34. In 30 tenths how many times 1?
35. In 35 fourths how many times 1?
36. In 37 eighths how many times 1?
37. In 43 fifths how many times 1?
38. In 48 ninths how many times 1?
39. In 53 tenths how many times 1?
40. In 57 eighths how many times 1?
41. In 76 tenths how many times 1?
42. In 78 ninths how many times 1?

SECTION IX.

A. 1. If a breakfast for 1 man cost 1 third of a dollar; what would a breakfast for two men cost?

2. How much is 2 times 1 third?

3. If it take you 1 third of an hour to travel 1 mile, how long will it take you to travel 3 miles?

4. How much is 3 times 1 third?

5. If 1 man can eat 1 third of a pound of meat at a meal, how much can 5 men eat?

6. How much is 7 times 1 third?

7. If 1 man can eat 2 thirds of a pound of meat for dinner, how many thirds of a pound would 3 men eat?

8. How much is 2 times 2 thirds?

9. A man gave to 4 paupers 2 thirds of a dollar apiece, how many thirds of a dollar did he give them? how many dollars?

10. 5 times 2 thirds are how many thirds? how many times 1?

11. If you give 3 men 1 fourth of a dollar apiece, how many fourths of a dollar will it take?

12. 3 times 1 fourth are how many fourths?

13. If you give 3 men 3 fourths of a bushel of

corn apiece, how many fourths of a bushel will it take? how many bushels?

14. 5 times 3 fourths are how many fourths? how many times 1?

15. If 1 horse eat 1 fifth of a bushel of oats in a day, how much will 4 horses eat in the same time?

16. 3 times 1 fifth are how many fifths?

17. If 1 man can earn 3 fifths of a dollar in a day, how much can he earn in 4 days?

18. 7 times 3 fifths are how many fifths? how many times 1?

19. If a family consume 2 sevenths of a barrel of flour in a week, how much would they consume in 5 weeks?

20. 6 times 2 sevenths are how many sevenths? how many times 1?

21. 5 times 3 eighths are how many eighths? how many times 1?

22. How much is 6 times 3 fifths?

23. How much is 7 times 5 sixths?

24. How much is 5 times 4 ninths?

25. How much is 6 times 8 ninths?

26. How much is 7 times 9 tenths?

27. How much is 5 times 7 tenths?

28. How much is 6 times 7 eighths?

29. How much is 9 times 5 eighths?

30. How much is 8 times 5 sevenths?

31. How much is 7 times 5 sixths?

32. How much is 8 times 7 fourths?

33. How much is 7 times 4 fifths?

34. How much is 5 times 3 eighths?

B. 1. If 1 bushel of wheat cost a dollar and 1 half, what will two bushels cost?

2. How much is 2 times 1 and 1 *half?**

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* This is to be understood 2 times 1 and 2 times 1 half, and to be answered thus: 2 times 1 are 2, and 2 times 1 half are 2 halves or 1, which, added to 2, makes 3.

3. If a barrel of cider cost 2 dollars and a half, what will 3 barrels cost? 7

4. How much is 4 times 2 and 1 *half?* 10

5. If a barrel of beer cost 3 dollars and a half, what will 2 barrels cost?

6. How much is 5 times 3 and 1 *half?* 17 1/2

7. How much is 6 times 3 and 1 *half?* 21

8. If a box of butter cost 2 dollars and 1 third of a dollar, what will 3 boxes cost? 7

9. How much is 4 times 2 and 1 *third?* 9 1/3

10. If you give to two persons 3 bushels and 1 third of a bushel of wheat apiece, how many bushels will it take?

11. How much is 5 times 3 and 1 *third?*

12. If you give to 4 persons each 2 oranges and 1 fourth of an orange, how many oranges will it take?

13. How much is 5 times 2 and 1 *fourth?* 11 1/4

14. If it take 3 yards and 2 thirds of a yard of cloth to make a suit of clothes, how many yards will it take to make 2 suits? 7 1/3

15. How much is 4 times 3 and 2 *thirds?*

16. If a family consume 2 bushels and 2 thirds of a bushel of malt in 1 month, how much will they consume in 3 months?

17. How much is 5 times 2 and 2 *thirds?*

18. How much is 4 times 3 and 3 *fourths?*

19. How much is 2 times 3 and 1 *fourth?*

20. How much is 3 times 3 and 3 *fourths?*

21. How much is 3 times 5 and 1 *fourth?*

22. If a horse eat 3 tons and 1 fifth of a ton of hay in a year, how much will 2 horses eat in the same time?

23. How much is 4 times 3 and 1 *fifth?*

24. If a man can travel 4 miles and 2 fifths of a mile in one hour, how far will he travel in 3 hours?

25. How much is 5 times 4 and 2 *fifths?*

26. How much is 3 times 5 and 3 *fifths?*

27. How much is 4 times 6 and 2 *fifths* ?

28. How much is 3 times 2 and 1 *sixth* ?

29. How much is 2 times 5 and 3 *sixths* ?

30. If a yard of cloth cost 4 dollars and 5 sixths of a dollar, what will 4 yards cost ?

31. How much is 7 times 4 and 5 *sixths* ?

32. How much is 2 times 3 and 3 *sevenths* ?

33. How much is 3 times 4 and 3 *sevenths* ?

34. If a bushel of wheat cost 7 shillings and 3 eighths, what will 5 bushels cost at that rate ?

35. How much is 3 times 4 and 5 *eighths* ?

36. How much is 4 times 3 and 7 *eighths* ?

37. A man bought 8 yards of cloth, at 9 dollars and 3 tenths a yard ; how much did it come to ?

38. How much is 6 times 2 and 2 *ninths* ?

39. How much is 4 times 5 and 3 *ninths* ?

40. A man bought 10 barrels of cider at 3 dollars and 5 sixths a barrel ; how much did it come to ?

41. How much is 3 times 7 and 2 *tenths* ?

42. What cost 8 barrels of beef at 9 dollars and 3 sevenths a barrel ?

C. 1. A boy wished to give 5 other boys 1 half pint of chestnuts apiece ? how many pints would it take ?

2. A boy wished to give 3 other boys 3 fourths of an orange apiece ; how many oranges would it take ?

3. A man gave to 10 persons 1 fifth of a bushel of corn apiece ; how many bushels did it take ?

4. A man gave to 7 men 3 fourths of a gallon of beer apiece ; how many gallons of beer did it take ?

5. If it take 1 yard and 1 fourth of a yard of cloth to make a pair of pantaloons, how many yards would it take to make 8 pair ?

6. If a family consume 2 bushels and 3 fifths of a bushel of grain in 1 week, how many bushels would they consume in 4 weeks ?

7. If a horse eat 3 bushels and 4 sevenths of a bushel of oats in 1 week, how many bushels would he eat in 8 weeks? 28 7/[illegible]

8. If a horse eat 5 loads and 3 eighths of a load of hay in 1 year, how many loads would 6 horses eat?

9. If a man travel 4 miles and 5 ninths in an hour, how many miles would he travel in 8 hours?

10. If in an orchard of 10 trees, each tree bears 8 bushels and 3 sevenths, how many bushels will the whole orchard bear?

11. If a man can build 5 rods and 7 eighths of a rod of wall in 1 day, how many rods can he build in 8 days?

12. If 3 men can build a piece of wall in 4 days and 3 fifths of a day, how many days would it take 1 man to build it?

13. If 1 man can build 7 rods and 2 fifths of wall in a day, how many rods would 10 men build?

14. If 1 man build 3 rods and 2 ninths of wall in 1 day, how many rods would 3 men build in 4 days?

15. If it take 1 yard and 3 sevenths of a yard of cloth to make 1 pair of pantaloons, and 2 yards and 4 sevenths for a coat; how many yards would it take to make 3 pair of pantaloons and 3 coats?

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SECTION X.

A. 1. If a yard of cloth cost 3 dollars, what will 1 half of a yard cost?

2. What is 1 half of 3?*

3. If a barrel of beer cost 5 dollars, what will 1 half of a barrel cost?

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* See Section V., article A.

4. What is 1 half of 5? 2½

5. If 2 barrels of cider cost 7 dollars, what is that a barrel?

6. What is 1 half of 7?

7. What is 1 half of 9?

8. What is 1 half of 11?

9. What is 1 half of 13?

10. What is 1 half of 15?

11. If you divide 1 bushel of wheat equally among 3 persons, what part of a bushel will you give them apiece? 1/3

12. If 3 yards of cloth cost 1 dollar, what part of a dollar will 1 yard cost?

13. What is 1 third of 1?

14. How could you divide 2 oranges into 3 equal parts? that is, how can you find 1 third of 2 oranges?*

15. One third of 2 oranges will be the same as how many thirds of one orange? 2

16. If you divide 2 bushels of wheat equally among 3 persons, what part of a bushel will you give them apiece?

17. If 3 bushels of corn cost 2 dollars, what part of a dollar will 1 bushel cost? 2/3

NOTE. *One third of two things is twice as much as one third of one thing. One third of one is* one third, *and consequently one third of two things is two thirds. In the same manner, one third of four things is four thirds of one thing. If four oranges be cut each into three parts, and then one part of each be taken, it will make four pieces, each of which is one third of one orange. Hence one third of four oranges is four thirds of one orange, that is, one whole one and one third.*

18. If 3 bushels of wheat cost 4 dollars, how much is that a bushel?

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[*] Divide each orange into three parts, and then take one part from each.

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19. What is one third of 2 ? of 4 ?

20. If 3 gallons of wine cost 5 dollars, what is that a gallon ?

21. What is 1 third of 5 ? of 7 ? of 8 ? of 10 ? of 11 ?

22. If a bushel of apples be divided equally among 4 persons, what part of a bushel will they have a piece ? What would they have apiece if 2 bushels were divided among them ? What if 3 bushels ? What if 5 bushels ? What if 6 bushels ?

23. What is 1 fourth of 1 ? of 2 ? of 3 ? of 5 ? of 6 ? of 7 ? of 9 ? of 10 ?

24. If a bushel of malt will serve 5 persons 1 month, how much will serve 1 person the same time ?

25. If 2 barrels of cider will serve 5 persons 1 month, how much will serve 1 person the same time ?

26. If 3 barrels of flour be divided among 5 men, how much will each have ? If 4 barrels were divided, what would each have ? What if 6 barrels were divided ? What if 7 barrels were divided ?

27. What is 1 fifth of 1 ? of 2 ? of 3 ? of 4 ? of 6 ? of 7 ?

28. What is 1 sixth of 1 ? of 2 ? of 3 ? of 4 ? of 5 ? of 7 ? of 8 ? of 9 ? of 10 ?

29. What is 1 seventh of 1 ? of 2 ? of 3 ? of 4 ? of 5 ? of 6 ?

30. What is 1 eighth of 1 ? of 2 ? of 3 ? of 4 ? of 5 ? of 6 ? of 7 ? of 8 ? of 9 ? of 10 ?

31. What is 1 ninth of 1 ? of 2 ? of 3 ? of 4 ? of 5 ? of 6 ? of 7 ? of 8 ? of 9 ? of 10 ? of 11 ?

32. What is 1 tenth of 1 ? of 2 ? of 3 ? of 4 ? of 5 ? of 6 ? of 7 ? of 8 ? of 9 ? of 10 ? of 11 ? of 12 ? of 13 ?

33. If 3 yards of cloth cost 2 dollars, what will 1 yard cost ? What will 2 yards cost ?

34. If 1 bushel of wheat cost 2 dollars, what

will 1 third of a bushel cost? What will 2 thirds of a bushel cost?

35. What is 1 third of 2?

36. What is 2 thirds of 2?

37. If a load of wood cost 5 dollars, what will 1 third of a load cost? What will 2 thirds of a load cost?

38. What is 1 third of 5?

39. What is 2 thirds of 5?

40. What is 2 thirds of 7?

41. If 4 bushels of salt cost 3 dollars, what will 1 bushel cost? What will 3 bushels cost?

42. What is 1 fourth of 3?

43. What is 3 fourths of 3?

44. If a barrel of cider cost 2 dollars, what will 1 fifth of a barrel cost? What will 2 fifths of a barrel cost?

45. What is 1 fifth of 2?

46. What is 2 fifths of 2?

47. What is 1 fifth of 7?

48. What is 3 fifths of 7?

49. If 7 gallons of gin cost 5 dollars, what will 1 gallon cost? What will 4 gallons cost?

50. What is 1 seventh of 5?

51. What is 4 sevenths of 5?

52. What is 1 sixth of 4?

53. What is 5 sixths of 4?

54. If you divide 7 dollars among 8 men, what part of a dollar will you give them apiece? What would three of them have?

55. What is 1 eighth of 7?

56. What is 3 eighths of 7?

57. What is 1 ninth of 10?

58. What is 7 ninths of 10?

59. What is 1 tenth of 14?

60. What is 4 tenths of 14?

61. If 5 yards of cloth cost 17 dollars, what is

that a yard? What would 3 yards cost? What woul 8 yards cost?

62. What is 3 fifths of 17?
63. What is 8 fifths of 17?
64. What is 5 sevenths of 20?
65. What is 2 ninths of 22?
66. What is 3 eighths of 27?
67. What is 2 thirds of 28?
68. What is 3 fourths of 31?
69. If 5 loads of hay cost 47 dollars, what is that a load? What will 2 loads cost? What will 7 loads cost? What will 12 loads cost?
70. What is 2 fifths of 47?
71. What is 7 fifths of 47?
72. What is 12 fifths of 47?
73. What is 4 sevenths of 48?
74. What is 4 ninths of 50?
75. What is 2 sevenths of 58?
76. What is 3 eighths of 61?
77. What is 4 tenths of 73?
78. What is 8 ninths of 65?
79. What is 9 tenths of 78?
80. What is 7 eighths of 70?

B. 1. If you divide 7 apples equally between 2 boys, how many would you give them apiece?

2. How can you divide 5 oranges equally among 3 persons?

3. Divide 3 bushels of corn equally among 5 men, how much would you give them apiece?

4. A boy had 7 pears, and gave away 3 fifths of them; how many did he give away? and how many had he left?

5. If 2 yards of cloth cost 3 dollars, what is that a yard?

6. If 4 yards of cloth cost 2 dollars, what is that a yard?

[Let the answers be given in dollars and cents or in shillings. 1 dollar is 100 cents.]

7. If 5 bushels of corn cost 7 dollars, what is that a bushel?

8. If a man receive 8 dollars for 6 days' work, what is that per day?

9. If 3 bushels of wheat cost 8 dollars, what will 2 bushels cost?

10. A man had 30 dollars, and gave away 3 sevenths of it; how much did he give away?

11. If 4 yards of cloth cost 10 dollars, what will 3 yards cost?

12. If 3 barrels of cider cost 8 dollars, what will 10 barrels cost?

13. If 7 pounds of flour cost 40 cents, what will 10 pounds cost?

14. If 4 firkins of butter cost 26 dollars, what will 7 firkins cost?

15. If 3 men can do a piece of work in 7 days, how long will it take 1 man to do it? How long would it take 4 men?

16. If 2 cocks will empty a cistern in 3 hours, in how long a time would 1 empty it? In how long a time would 7 cocks empty it?

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SECTION XI.

A. 1. Bought 1 half of a yard of cloth for 1 dollar and 1 half; what was that a yard?

2. 1 and 1 half is the half of what number?*

3. If 1 third of a yard of cloth cost 1 dollar and 3 fourths of a dollar, how much does a yard cost?

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* See sect. VI. art. A., and sect. IX. art. B.

4. 2 and 3 fourths is 1 third of what number?

5. If 1 half of a barrel of beer cost 2 dollars and 1 fourth of a dollar, how much will a barrel cost?

6. 2 and 3 fourths is one half of what number?

7. If 1 fourth of a box of lemons cost 3 dollars and 2 thirds of a dollar, what will a box cost?

8. 2 and 2 thirds is 1 fourth of what number?

9. 3 and 1 half is 1 fourth of what number?

10. If 1 third of a barrel of pork cost 4 dollars and 1 third of a dollar, what will 1 barrel cost?

11. 4 and 2 thirds is 1 third of what number?

12. If 1 sixth of a barrel of fish cost 2 dollars and 1 fifth of a dollar, what will a barrel cost?

13. 3 and 2 fifths is 1 sixth of what number?

14. If 1 fifth of a barrel of salmon cost 3 dollars and 2 sevenths of a dollar, what is that a barrel?

15. 4 and 3 sevenths is 1 fifth of what number?

16. If a man can travel 4 miles and 3 sevenths of a mile in 1 ninth of a day, how far will he travel in a whole day?

17. 5 and 3 sevenths is 1 ninth of what number?

18. 2 and 4 fifths is 1 seventh of what number?

19. 6 and 3 eighths is 1 eighth of what number?

20. 7 and 5 sixths is 1 third of what number?

21. 8 and 3 sevenths is 1 fourth of what number?

22. 5 and 3 tenths is 1 seventh of what number?

23. 8 and 5 ninths is 1 fifth of what number?

24. 9 and 4 fifths is 1 eighth of what number?

25. 6 and 4 tenths is 1 tenth of what number?

26. 7 and 4 ninths is 1 fifth of what number?

27. 8 and 7 tenths is 1 seventh of what number?

B. 1. If 2 thirds of a barrel of beef cost 3 dollars, what does 1 third of a barrel cost?

2. 3 is 2 times what number?*

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* See section VI, article B.

Ans. 3 is 2 times the half of 3; but 1 half of 3 is 3 halves, or 1 and 1 half,* therefore 3 is 2 times 1 and 1 half.

3. If 3 fifths of a yard of cloth cost 4 dollars, what will 1 fifth of a yard cost?

4. 5 is 3 times what number? 1 2/3

5. If 3 sevenths of a barrel of pork cost 2 dollars, what will 1 seventh of a barrel cost? 2/3

6. 2 is 3 times what number?

7. If 4 thirds of a bunch of shingles cost 5 dollars, what does 1 third of a bunch cost? 1 1/4

8. 7 is 4 times what number? 1 3

9. 2 is 4 times what number?

10. A man bought 4 ninths of a barrel of flour for three dollars; what would be the price of 1 ninth of a barrel at the same rate?

11. 5 is 4 times what number?

12. A man bought 5 eighths of a hundred weight of sugar for 6 dollars; what would 1 eighth of a hundred weight cost at the same rate?

13. 7 is 5 times what number?

14. 3 is 5 times what number?

15. 8 is 5 times what number?

16. 9 is 4 times what number?

17. 11 is 6 times what number?

18. 13 is 7 times what number?

19. 14 is 8 times what number?

20. 17 is 5 times what number?

21. 18 is 8 times what number?

22. 17 is 9 times what number?

23. 15 is 10 times what number?

24. 20 is 9 times what number?

25. 22 is 10 times what number?

26. 24 is 7 times what number?

27. If 2 thirds of a barrel of beef cost 3 dollars,

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* See section X, article A.

what will 1 third of a barrel cost? What will the whole barrel cost? 4

28. *If 5 is 2 thirds of some number, what is 1 third of the same number? 2 and 1 half is 1 third of what number? Then 5 is two thirds of what number? 7½

29. If 3 fourths of a barrel of flour cost 5 dollars, what will 1 fourth of a barrel cost? What will the whole barrel cost?

30. If 8 is 3 fourths of some number, what is 1 fourth of the same number? 2 and 2 thirds is 1 fourth of what number? Then 8 is 3 fourths of what number?

31. A man bought 2 sevenths of a barrel of oil for 5 dollars, how much will 1 seventh cost at the same rate? How much would a barrel cost?

32. If 9 is 2 sevenths of some number, what is 1 seventh of the same number? 4 and 1 half is 1 seventh of what number? Then 9 is 2 sevenths of what number?

33. Bought 5 eighths of a chaldron of coal for 7 dollars, what is the price of 1 eighth at the same rate? What is the price of the whole chaldron?

34. If 12 is 5 eighths of some number, what is 1 eighth of the same number? 2 and 2 fifths is 1 eighth of what number? Then 12 is 5 eighths of what number?

35. If a man can do 7 ninths of a piece of work in 4 days, how long would it take him to do 1 ninth of it? How long would it take him to do the whole?

36. If 3 is 7 ninths of some number, what is 1 ninth of the same number? 3 sevenths is 1 ninth of what number? Then 3 is 7 ninths of what number?

37. If 3 fifths of a chaldron of coal cost 8 dollars, what is the whole chaldron worth?

38. 7 is 3 fifths of what number?

39. A man bought 6 sevenths of a cask of raisins for 5 dollars; what was the whole cask worth?

40. 8 is 6 sevenths of what number?

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* See section VI, article B, examples 8 and following.

41. A man had 4 sixths of a week's board for 3 dollars; how much is that for a whole week?

42. 3 is 5 sixths of what number?

43. 9 is 5 eighths of what number?

44. 10 is 7 thirds of what number?

45. 11 is 6 fifths of what number?

46. 12 is 7 fifths of what number?

47. 15 is 2 sevenths of what number?

48. 17 is 3 tenths of what number?

49. A man bought 5 eighths of a cask of wine for 19 dollars, what would the whole cask cost?

50. 19 is 3 eighths of what number?

51. 21 is 4 fifths of what number?

52. Bought 5 ninths of a ton of logwood for 23 dollars; what would a ton cost at that rate?

53. 23 is 7 ninths of what number?

54. 21 is 3 tenths of what number?

55. 29 is 4 sevenths of what number?

56. 31 is 5 eighths of what number?

57. 33 is 6 sevenths of what number?

58. 38 is 4 ninths of what number?

59. A man bought 1 barrel and 1 seventh of a barrel of wine for 41 dollars; what was that a barrel?

NOTE. *1 barrel and* 1 *seventh of a barrel is the same as* 8 *sevenths of a barrel. If* 8 *sevenths of a barrel cost* 41 *dollars, what does a barrel cost?*

60. 35 is 8 sevenths of what number?

61. A man bought 1 ton and 4 fifths of a ton (that is, 9 fifths of a ton) of fustic for 43 dollars, what was that a ton?

62. 52 is 9 fifths of what number?

63. Bought 1 ton and 2 sevenths of a ton of log wood for 48 dollars, what was that a ton?

64. 67 is 9 sevenths of what number?

65. 53 is 7 tenths of what number?

66. 58 is 9 eighths of what number?

67. 61 is 10 ninths of what number?

68. Bought 2 barrels and 1 fifth of a barrel of gin (that is, 11 fifths of a barrel) for 65 dollars; what was that a barrel?

69. 65 is 9 fifths of what number?

70. 71 is 8 elevenths of what number?

C. 1. A boy gave away 2 apples and 1 half, which was 1 fourth of all he had; how many had he? 10

2. A man gave away 3 dollars, which was 2 fifths of all the money he had; how much had he? [illegible]

3. A man sold a cow for fifteen dollars, which was 4 fifths of what she cost him; how much did he lose by the bargain? 3 3/4

4. A man sold a piece of cloth for 37 dollars, which was 9 eighths of what it cost him; how much did he gain by the bargain? 4 1/9

5. There is a pole 3 fifths under water, and 7 feet out of the water; how long is the pole? 17 1/2

6. A man sold a piece of cloth for 47 dollars, by which bargain he lost 2 ninths of what the cloth cost him; how much did it cost him, and how much did he lose? 13 3/7 60 3/7

Miscellaneous Examples.

1. If a staff 5 feet long cast a shadow 4 feet at 12 o'clock, what is the length of a pole that casts a shadow 67 feet at the same time?

2. If 53 gallons of water, in 1 hour, run into a cistern containing 97 gallons, and 44 gallons run out in an hour, in what time will it be filled?

3. A man bought a cask of wine containing 75 gallons; 2 sevenths of it leaked out, and he sold the remainder for 1 dollar a gallon; how much did he sell it for?

4. A cask of wine cost 67 dollars; what is 5 eighths of it worth?

5. A man bought 9 oranges for 6 cents and 2 sevenths apiece, and sold them for 67 cents; what did he gain by the bargain? 10 2/7

6. A man bought 10 yards of broadcloth for 70 dollars; how must he sell it per yard in order to gain 14 dollars?

7. If when the days are 12 hours long, a man perform a journey in 3 days, how many hours is he in performing it?

8. If a man perform a journey in 36 hours, how many days would he be in performing it when the days are nine hours long? 4

9. If when the days are 11 hours long, a man can perform a journey in 5 days, in how many hours will he perform it? In how many days when the days are 9 hours long? 6

10. What number added to 2 fifths of 33, will make the number 17?

11. How many yards of cloth, that is 1 quarter of a yard wide, will line 10 yards, that is 3 quarters wide?

12. 8 yards of cloth that is 1 quarter wide are equal to how many yards that is 4 quarters wide? 2

13. How many yards of cloth, that is 3 quarters wide, are equal to 7 yards that is 5 quarters wide?

14. How many yards of cloth, that is 6 quarters wide, are equal to 37 that is 4 quarters wide?

15. If a piece of cloth, 5 quarters wide, be worth 37 dollars, what is a piece of the same length, 3 quarters wide, worth?

16. If cloth 4 quarters wide is worth 8 dollars a yard, what is 1 yard of the same kind of cloth, that is 5 quarters wide, worth?

SECTION XII.

PARTS of one are called fractions. Fractions may be expressed by figures, as well as whole numbers. It requires two numbers to express a fraction; one, to show into how many parts one is divided; and the other to show how many of those parts are used. For example, if we wish to express *one half*, (which means that one is divided into two equal parts, and that one part is used) we must use the figure 2 to express that one is divided into two equal parts, and the figure 1 to show that one part is used. And these must be written in such a manner that we may always know what each of them is intended to express.

One half is usually written thus $\frac{1}{2}$; one number above a line and the other below it. The number below the line shows into how many parts one is divided, and the number above the line shows how many parts are used.

One third is written - - - - $\frac{1}{3}$
Two thirds - - - - - $\frac{2}{3}$
One fourth - - - - - $\frac{1}{4}$
Three fourths - - - - $\frac{3}{4}$
Two fifths - - - - - $\frac{2}{5}$

Example. $\frac{3}{7}$ of an apple signifies that the apple is to be cut into 7 equal parts, and that 3 parts are to be used.

Let us apply an example to Plate II. $\frac{5}{8}$ refers to a square divided into 8 parts, and signifies that 5 parts are to be used.

We may observe, that when one is divided into 3 parts, the parts are called *thirds*, when one is divided into 4 parts, the parts are called *fourths*, &c. that is, the fraction takes its name from the number of parts into which one is divided. The number under the line is called the *denominator*, because it gives name to the fraction; and the number above the line is called the *numerator*, because it shows the number of parts used. Thus $\frac{3}{10}$, 10 is the *denominator* and 3 the *numerator*.

N. B. The pupil must be made familiar with this mode of expressing fractions, and must be able to apply it to any familiar objects; as apples, oranges, &c.; and to the table, before he is allowed to proceed any farther. Particular care must be taken to make him understand what the denominator signifies, and what the numerator, as explained above. The denominator should always be explained first.

The following examples are a recapitulation of some of the foregoing sections, for the purpose of showing the application of the above method of writing fractions.

See Section VIII. A.

A. 1. In 2 how many times $\frac{1}{2}$? *Ans.* $\frac{4}{2}$.*
2. In 3 how many times $\frac{1}{2}$? *Ans.* $\frac{6}{2}$.
3. In 2 how many times $\frac{1}{3}$? *Ans* $\frac{6}{3}$
4. In 4 how many times $\frac{1}{3}$?
5. In 6 how many times $\frac{1}{4}$?
6. In 7 how many times $\frac{1}{6}$?
7. In 8 how many times $\frac{1}{5}$?
8. In $2\frac{1}{2}$† how many times $\frac{1}{2}$?
9. In $3\frac{1}{4}$ how many times $\frac{1}{4}$?
10. Reduce $4\frac{1}{5}$ to an improper fraction.‡
11. Reduce $3\frac{3}{7}$ to an improper fraction.
12. Reduce $5\frac{3}{8}$ to an improper fraction.

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* When the numerator is larger than the denominator, the fraction is called an *improper* fraction.

† 2 1-2 is read two and 1 half. It is called a *mixed number*.

‡ That is, to find how many fifths there are in four and 1 fifth.

13. Reduce $6\frac{2}{9}$ to an improper fraction.
14. Reduce $8\frac{3}{10}$ to an improper fraction.
15. Reduce $9\frac{4}{7}$ to an improper fraction.

B. 1. $\frac{4}{2}$ are how many times 1?
2. $\frac{6}{2}$ are how many times 1?
3. $\frac{7}{2}$ are how many times 1?
4. $\frac{8}{4}$ are how many times 1?
5. $\frac{9}{5}$ are how many times 1?
6. $\frac{16}{7}$ are how many times 1?
7. $\frac{18}{5}$ are how many times 1?
8. $\frac{23}{7}$ are how many times 1?
9. $\frac{26}{8}$ are how many times 1?
10. $\frac{37}{10}$ are how many times 1?

See Section IX.

A. 1. How much is 3 times $\frac{1}{2}$?
2. How much is 4 times $\frac{1}{3}$?
3. How much is 3 times $\frac{2}{5}$?
4. How much is 4 times $\frac{3}{7}$?
5. How much is 5 times $\frac{3}{8}$?
6. How much is 6 times $\frac{4}{5}$?
7. How much is 8 times $\frac{3}{10}$?
8. How much is 9 times $\frac{6}{7}$?
9. How much is 10 times $\frac{5}{9}$?
10. How much is 9 times $\frac{6}{5}$?

B. 1. How much is 3 times $2\frac{1}{2}$?
2. How much is 4 times $3\frac{2}{3}$?
3. How much is 5 times $6\frac{4}{7}$?
4. How much is 6 times $4\frac{5}{8}$?
5. How much is 7 times $5\frac{2}{7}$?
6. How much is 8 times $6\frac{4}{9}$?
7. How much is 4 times $10\frac{3}{7}$?

8. How much is 9 times $7\frac{4}{6}$?
9. How much is 8 times $9\frac{4}{9}$?
10. How much is 10 times $7\frac{3}{5}$?

See Sections V. & X.

1. What is $\frac{1}{2}$ of 6 ?
2. What is $\frac{1}{3}$ of 6 ?
3. What is $\frac{1}{4}$ of 8 ?
4. What is $\frac{1}{3}$ of 9 ?
5. What is $\frac{2}{3}$ of 9 ?
6. What is $\frac{1}{5}$ of 10 ?
7. What is $\frac{2}{7}$ of 14 ?
8. What is $\frac{1}{3}$ of 5 ?
9. What is $\frac{3}{5}$ of 5 ?
10. What is $\frac{1}{9}$ of 7 ?
11. What is $\frac{2}{9}$ of 7 ?
12. What is $\frac{3}{7}$ of 35 ?
13. What is $\frac{1}{5}$ of 17 ?
14. What is $\frac{3}{7}$ of 26 ?
15. What is $\frac{5}{8}$ of 27 ?
16. What is $\frac{4}{9}$ of 37 ?
17. What is $\frac{6}{7}$ of 47 ?
18. What is $\frac{3}{4}$ of 42 ?
19. What is $\frac{4}{7}$ of 65 ?
20. What is $\frac{6}{7}$ of 75 ?

See Sections VI. & XI.

A. 1. 2 is $\frac{1}{2}$ of what number ?
2. 4 is $\frac{1}{3}$ of what number ?
3. 8 is $\frac{1}{5}$ of what number ?
4. $1\frac{1}{2}$ is $\frac{1}{2}$ of what number
5. $2\frac{3}{5}$ is $\frac{1}{3}$ of what number ?
6. $4\frac{2}{7}$ is $\frac{1}{4}$ of what number ?
7. $6\frac{4}{9}$ is $\frac{1}{7}$ of what number ?
8. $7\frac{6}{7}$ is $\frac{1}{8}$ of what number ?
9. $8\frac{4}{5}$ is $\frac{1}{6}$ of what number ?
10. $9\frac{3}{10}$ is $\frac{1}{10}$ of what number ?

B. 1. 4 is $\frac{2}{3}$ of what number ?
2. 6 is $\frac{3}{4}$ of what number ?
3. 8 is $\frac{4}{5}$ of what number ?

4. 12 is $\frac{3}{7}$ of what number?
5. 15 is $\frac{5}{8}$ of what number?
6. 18 is $\frac{6}{7}$ of what number?
7. 20 is $\frac{5}{9}$ of what number?
8. 24 is $\frac{8}{5}$ of what number?
9. 28 is $\frac{7}{3}$ of what number?
10. 30 is $\frac{5}{10}$ of what number?
11. 3 is $\frac{2}{3}$ of what number?
12. 4 is $\frac{3}{5}$ of what number?
13. 5 is $\frac{4}{7}$ of what number?
14. 8 is $\frac{3}{8}$ of what number?
15. 9 is $\frac{5}{7}$ of what number?
16. 17 is $\frac{6}{5}$ of what number?
17. 25 is $\frac{4}{9}$ of what number?
18. 38 is $\frac{3}{5}$ of what number?
19. 43 is $\frac{9}{7}$ of what number?
20. 54 is $\frac{10}{9}$ of what number?

Miscellaneous Examples.

1. A man sold 8 yards of cloth for $3\frac{4}{5}$ dollars a yard; what did it come to? $30\frac{2}{5}$

2. A man sold a horse for 76 dollars, which was $\frac{2}{5}$ of what it cost him; how much did it cost him?

3. A man sold $\frac{3}{5}$ of a gallon of wine for 40 cents; what was that a gallon?

4. If it will take $1\frac{7}{8}$ yards of cloth to make a coat, how many yards will it take to make 7 coats? 13

5. If 1 horse consume $3\frac{1}{7}$ bushels of oats in 2 days, how much would 2 horses in 5 days? $15\frac{5}{7}$

6. If when the days are $9\frac{1}{2}$ hours long a man perform a journey in 10 days, in how many days would he perform it when the days are 12 hours long? 7

7. A man sold 8 yards of cloth for $7\frac{3}{5}$ dollars a yard, and received 8 firkins of butter at $6\frac{2}{5}$ dollars a firkin; how much was then due to him? $9\frac{3}{5}$

8. Two men are 38 miles apart, and are travel-

ing towards each other, one at the rate of 3 miles an hour, the other 2 miles; how much do they approach each other in an hour? How much in 2 hours? In how many hours will they meet? At what distance from each place from which they set out? 2 9

4 1 5/5 2

SECTION XIII.

A. 1. If you give $\frac{1}{2}$ of an orange to one boy, and $\frac{1}{4}$ to another, how much more do you give the first, than the second?

2. $\frac{1}{2}$ of an orange is how many $\frac{1}{4}$ of an orange?

3. If you give $\frac{1}{2}$ of an orange to one boy, and $\frac{1}{4}$ to another, how many $\frac{1}{4}$ would you give away? How many $\frac{1}{4}$ would you have left?

4. $\frac{1}{2}$ and $\frac{1}{4}$ are how many $\frac{1}{4}$?

5. A man gave to one labourer $\frac{1}{2}$ of a bushel of wheat, and $\frac{3}{4}$ to another; how many $\frac{1}{4}$ of a bushel did he give to both? How many bushels?

6. $\frac{1}{2}$ and $\frac{3}{4}$ are how many $\frac{1}{4}$? How many times 1?

7. A man gave $\frac{1}{2}$ of a barrel of flour to one man, and $\frac{3}{6}$ of a barrel to another; to which did he give the most?

8. $\frac{1}{2}$ is how many $\frac{1}{6}$?

9. A man bought $\frac{1}{3}$ of a bushel of wheat at one time, and $\frac{2}{6}$ of a bushel at another; at which time did he buy the most?

10. $\frac{1}{3}$ is how many $\frac{1}{6}$?

11. A man bought $\frac{2}{3}$ of a yard of cloth at one time, and $\frac{4}{6}$ of a yard at another; at which time did he buy the most?

12. $\frac{2}{3}$ are how many $\frac{1}{6}$?

13. A man wished to give $\frac{1}{2}$ of a bushel of wheat

to one man, and $\frac{1}{3}$ of a bushel to another; but he could not tell how to divide it. Another man standing by advised him to divide the whole bushel into six equal parts first, and then take $\frac{1}{2}$ of them for one, and $\frac{1}{3}$ of them for the other. How many parts did he give to each? How many to both? How many had he left?

14. $\frac{1}{2}$ is how many $\frac{1}{6}$? $\frac{1}{3}$ is how many $\frac{1}{6}$? $\frac{1}{2}$ and $\frac{1}{3}$ are how many $\frac{1}{6}$?

15. A man paying some money to his labourers, gave each man $\frac{1}{2}$ of a dollar, and each boy $\frac{1}{6}$ of a dollar; how much more did he give to a man than to a boy?

16. What is the difference between $\frac{1}{2}$ and $\frac{1}{6}$?

17. If a man can earn $\frac{4}{6}$ of a dollar in a day, and a boy $\frac{1}{2}$ of a dollar, how much does the man earn more than the boy?

18. What is the difference between $\frac{4}{6}$ and $\frac{1}{2}$?

19. A boy distributing some nuts among his companions, gave $\frac{1}{3}$ of a quart to one, and $\frac{1}{2}$ of a quart to another; how much more did he give to one, than to the other?

NOTE. *Change them to sixths.*

20. What is the difference between $\frac{1}{3}$ and $\frac{1}{2}$?

21. A man having two bushels of grain to distribute among his labourers, wished to give $\frac{1}{2}$ of a bushel to one, and $\frac{2}{3}$ of a bushel to another, and the rest to a third; but was at a loss to tell how to divide it; at last he concluded to divide each bushel into six equal parts, or sixths, and then to distribute those parts. How many sixths did he give to each?

22. $\frac{2}{3}$ is how many $\frac{1}{6}$?

23. A man had a horse, and a cow, and a sheep. The horse would eat $\frac{2}{3}$ of a load of hay in the winter, the cow $\frac{1}{2}$, and the sheep $\frac{1}{6}$. How many $\frac{1}{6}$ of a load would each eat? How many $\frac{1}{6}$ would they all eat? How many loads?

24. A boy having a quart of nuts, wished to divide them, so as to give one companion $\frac{1}{2}$, another $\frac{1}{4}$, and a third $\frac{1}{8}$ of them; but in order to make a proper division, he first divided the whole into eight equal parts, and then he was able to divide them as he wished. How many eighths did he give to each? How many eighths had he left for himself?

25. $\frac{1}{2}$ is how many $\frac{1}{8}$? $\frac{1}{4}$ is how many $\frac{1}{8}$? $\frac{1}{2}$ and $\frac{1}{4}$ and $\frac{1}{8}$ are how many $\frac{1}{8}$?

26. A man gave $\frac{3}{4}$ of a barrel of flour to one man, and $\frac{5}{8}$ of a barrel to another; to which did he give the most? How much?

27. Which is the largest $\frac{3}{4}$ or $\frac{5}{8}$? How much the largest?

28. A boy having a pound of almonds, said he intended to give $\frac{1}{3}$ of them to his sister, and $\frac{1}{4}$ to his brother, and the rest to his mamma. His mamma smiling said she did not think he could divide them so. O yes I can said he, I will first divide them into twelve equal parts, and then I can divide them well enough. Pray how many twelfths did he give to each?

29. $\frac{1}{3}$ is how many $\frac{1}{12}$? $\frac{1}{4}$ is how many $\frac{1}{12}$? $\frac{1}{3}$ and $\frac{1}{4}$ are how many $\frac{1}{12}$?

30. Mr. Goodman having a pound of raisins, said he would give Sarah $\frac{1}{3}$, and Mary $\frac{1}{4}$, and James $\frac{1}{6}$ of them, and he told Charles he should have the rest, if he could tell how to divide them. Well, said Charles, I would first divide the whole into twelve equal parts, and then I could take $\frac{1}{3}$ and $\frac{1}{4}$ and $\frac{1}{6}$ of them. How many twelfths would each have?

31. $\frac{1}{3}$ and $\frac{1}{4}$ and $\frac{1}{6}$ are how many $\frac{1}{12}$?

32. George bought a pine apple, and said he would give $\frac{1}{4}$ of it to his papa, and $\frac{2}{5}$ to his mamma, and $\frac{3}{10}$ to his brother James, if he could divide it. James took it, and cut it into twenty equal pieces,

and then distributed them as George had desired. How many twentieths did he give to each ?

33. $\frac{1}{4}$ is how many $\frac{1}{20}$? $\frac{1}{5}$ is how many $\frac{1}{20}$? $\frac{2}{5}$ is how many $\frac{1}{20}$? $\frac{1}{10}$ is how many $\frac{1}{20}$

34. $\frac{1}{2}$ is how many $\frac{1}{10}$?

35. $\frac{1}{2}$ is how many $\frac{1}{14}$?

36. $\frac{1}{3}$ is how many $\frac{1}{9}$?

37. $\frac{1}{3}$ is how many $\frac{1}{15}$?

38. $\frac{2}{3}$ are how many $\frac{1}{9}$?

39. $\frac{2}{3}$ are how many $\frac{1}{21}$?

40. $\frac{1}{5}$ is how many $\frac{1}{10}$?

41. $\frac{3}{5}$ are how many $\frac{1}{15}$?

42. $\frac{5}{6}$ are how many $\frac{1}{18}$?

43. $\frac{4}{7}$ are how many $\frac{1}{21}$?

44. $\frac{6}{7}$ are how many $\frac{1}{35}$?

45. $\frac{3}{8}$ are how many $\frac{1}{56}$?

46. $\frac{2}{9}$ are how many $\frac{1}{36}$?

47. $\frac{3}{10}$ are how many $\frac{1}{20}$?

48. Reduce $\frac{1}{2}$ to sixths and $\frac{1}{3}$ to sixths.

49. $\frac{3}{6}$ and $\frac{2}{6}$ are how many $\frac{1}{6}$?

50. Reduce $\frac{1}{2}$ and $\frac{1}{4}$ to eighths.

51. $\frac{1}{2}$ and $\frac{1}{4}$ are how many $\frac{1}{8}$?

52. $\frac{1}{2}$ and $\frac{1}{4}$ are how many $\frac{1}{4}$?

53. $\frac{2}{3}$ and $\frac{1}{6}$ are how many $\frac{1}{6}$?

54. $\frac{1}{4}$ and $\frac{5}{8}$ are how many $\frac{1}{8}$?

55. $\frac{1}{3}$ and $\frac{4}{9}$ are how many $\frac{1}{9}$?

56. $\frac{1}{2}$ and $\frac{2}{5}$ are how many $\frac{1}{10}$?

57. $\frac{1}{2}$ and $\frac{1}{4}$ and $\frac{1}{8}$ are how many $\frac{1}{8}$?

58. $\frac{1}{2}$ and $\frac{3}{5}$ and $\frac{1}{10}$ are how many $\frac{1}{10}$?

59. $\frac{2}{3}$ and $\frac{1}{4}$ are how many $\frac{1}{12}$?

60. $\frac{2}{3}$ and $\frac{1}{4}$ and $\frac{1}{6}$ are how many $\frac{1}{12}$?

61. $\frac{3}{5}$ and $\frac{3}{10}$ and $\frac{1}{4}$ are how many $\frac{1}{20}$?

62. $\frac{1}{2}$ and $\frac{1}{3}$ and $\frac{3}{4}$ and $\frac{1}{6}$ and $\frac{1}{12}$ are how many $\frac{1}{12}$?

63. $\frac{1}{2}$ and $\frac{3}{7}$ are how many $\frac{1}{14}$?

64. $\frac{2}{5}$ and $\frac{1}{3}$ are how many $\frac{1}{15}$?

65. $\frac{2}{3}$ and $\frac{3}{5}$ are how many $\frac{1}{15}$?

66. $\frac{2}{3}$ less $\frac{1}{6}$ are how many $\frac{1}{6}$?

67. $\frac{2}{3}$ and $\frac{3}{4}$ less $\frac{5}{12}$ are how many $\frac{1}{12}$?
68. $\frac{5}{6}$ less $\frac{2}{9}$ are how many $\frac{1}{18}$?
69. $\frac{5}{6}$ less $\frac{3}{8}$ are how many $\frac{1}{24}$?
70. $\frac{4}{5}$ less $\frac{2}{7}$ are how many $\frac{1}{35}$?
71. $\frac{1}{2}$ and $\frac{3}{4}$, and $\frac{1}{6}$, and $\frac{5}{12}$, less $\frac{5}{8}$ are how many $\frac{1}{24}$?
72. $\frac{1}{4}$ and $\frac{1}{8}$, and $\frac{2}{5}$, and $\frac{1}{10}$, and $\frac{1}{20}$, less $\frac{7}{8}$ are how many $\frac{1}{40}$?
73. $\frac{1}{7}$ and $\frac{3}{6}$ are how many $\frac{1}{42}$?
74. $\frac{3}{8}$ and $\frac{5}{7}$ are how many $\frac{1}{56}$?
75. $\frac{4}{7}$ and $\frac{2}{9}$ are how many $\frac{1}{62}$?

When the denominators in two or more fractions are the same, the fractions are said to have a common denominator. Thus $\frac{4}{8}$ and $\frac{3}{8}$ have a common denominator. We have seen that when two or more fractions have a common denominator, they may be added and subtracted as well as whole numbers. We add or subtract the numerators and write their sum or difference over the common denominator. The first part of the process in the above examples was to reduce them to a common denominator.

76. Reduce $\frac{2}{3}$ and $\frac{3}{4}$ to a common denominator.

NOTE. They may be reduced to twelfths.

If it cannot be immediately seen what number must be the common denominator, it may be found by multiplying all the denominators together; for that will always produce a number, divisible by all the denominators.

77. Reduce $\frac{2}{3}$ and $\frac{3}{5}$ to a common denominator.
78. Reduce $\frac{2}{3}$ and $\frac{3}{4}$ and $\frac{5}{6}$ to a common denominator.
79. Reduce $\frac{1}{3}$ and $\frac{3}{7}$ to a common denominator.
80. Reduce $\frac{3}{7}$ and $\frac{2}{5}$ to a common denominator.

81. Reduce $\frac{1}{3}$ and $\frac{2}{3}$ and $\frac{3}{4}$ to a common denominator.

82. Add together $\frac{2}{3}$ and $\frac{2}{5}$.

83. Add together $\frac{3}{7}$ and $\frac{5}{14}$.

84. Add together $\frac{3}{9}$ and $\frac{5}{18}$.

85. Add together $\frac{1}{2}$ and $\frac{2}{5}$ and $\frac{3}{10}$.

86. Subtract $\frac{1}{3}$ from $\frac{1}{2}$.

87. Subtract $\frac{3}{10}$ from $\frac{2}{5}$.

88. Subtract $\frac{2}{7}$ from $\frac{2}{3}$.

89. Subtract $\frac{2}{9}$ from $\frac{5}{6}$.

B. 1. Mr. F. said he would give $\frac{1}{2}$ of a pine apple to Fanny, and $\frac{2}{5}$ to George, and the rest to the one that could tell how to divide it, and how much there would be left. But neither of them could tell, so he kept it himself. Could you have told if you had been there? How would you divide it? How much would be left? 1/10

2. A man sold $1\frac{1}{2}$ bushels of wheat to one man, $4\frac{3}{4}$ bushels to another; how many bushels did he sell to both? 6 1/4

3. A man bought $6\frac{1}{2}$ bushels of wheat at one time, and $2\frac{1}{3}$ at another. How much did he buy in the whole? 8 5/6

4. A man bought $7\frac{2}{3}$ yards of one kind of cloth, and $6\frac{3}{4}$ yards of another kind; how many yards in the whole? 14 5/12

5. A man bought $\frac{3}{5}$ of a barrel of beer at one time, $2\frac{1}{3}$ barrels at another, and $6\frac{3}{4}$ at another; how much did he buy in the whole?

6. A man bought one sheep for $4\frac{2}{3}$ dollars, and another for $5\frac{3}{7}$ dollars; how much did he give for both?

7. There is a pole standing, so that $\frac{1}{3}$ of it is in the mud, and $\frac{2}{5}$ of it in the water, and the rest out of the water; how much of it was out of the water?

8. A man having undertaken to do a piece of work, did $\frac{1}{2}$ of it the first day, $\frac{1}{3}$ of it the second day, and $\frac{1}{6}$ of it the third day, how much of it did he do in three days ?

9. A man having a piece of work to do, hired two men and a boy to do it. The first man could do $\frac{1}{3}$ of the work in a day, and the other $\frac{1}{4}$ of it, and the boy $\frac{1}{5}$ of it ; how much of it would they all do in a day ?

C. It will be seen by looking on plate III, that $\frac{2}{4}$ is the same as $\frac{1}{\text{[illegible]}}$, and that $\frac{3}{6}$ is the same as $\frac{1}{2}$, and that $\frac{4}{6}$ is the same as $\frac{2}{3}$; $\frac{2}{4}$, $\frac{3}{6}$, can therefore be reduced to $\frac{1}{2}$, and $\frac{4}{6}$ to $\frac{2}{3}$. This is called reducing fractions to their lowest terms.

1. Reduce $\frac{6}{8}$ to its lowest terms.* *Ans.* $\frac{3}{4}$.
2. Reduce $\frac{5}{10}$ to its lowest terms.
3. Reduce $\frac{6}{9}$ to its lowest terms.
4. Reduce $\frac{4}{12}$ to its lowest terms.
5. Reduce $\frac{10}{14}$ to its lowest terms.
6. Reduce $\frac{5}{15}$ to its lowest terms.
7. Reduce $\frac{5}{20}$ to its lowest terms.
8. Reduce $\frac{18}{24}$ to its lowest terms.
9. Reduce $\frac{14}{35}$ to its lowest terms.
10. Reduce $\frac{8}{40}$ to its lowest terms.
11. Reduce $\frac{25}{30}$ to its lowest terms.
12. Reduce $\frac{21}{35}$ to its lowest terms.
13. Reduce $\frac{43}{56}$ to its lowest terms.
14. Reduce $\frac{27}{72}$ to its lowest terms.

Note. It will be seen by the above section that if both the numerator and denominator be multiplied by the same number, the value of the fraction will not be altered ; or if they can both be divided by the same number without a remainder, the fraction will not be altered.

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* If this article should be found too difficult for the pupil, he may omit it till after the next section.

SECTION XIV.

A. 1. A BOY having ½ of an orange gave away ½ of that, what part of the whole orange did he give away?

2. What is ½ of ½?

3. If you cut an apple into three pieces, and then cut each of those pieces into two pieces, how many pieces will the whole apple be cut into? What part of the whole apple will one of the pieces be?

4. What is ½ of ⅓?

5. A boy had ½ of a pine apple, and cut that half into three pieces, in order to give away ⅓ of it. What part of the whole apple did he give away?

6. What is ⅓ of ½?

7. If an orange be cut into 4 parts, and then each of the parts be cut in two, how many pieces will the whole be cut into?

8. What is ½ of ¼?

9. A man having ½ a barrel of flour, sold ¼ of that; how much did he sell?

10. What is ¼ of ½?

11. If an orange be cut into 4 equal parts, and each of those parts be cut into 3 equal parts, how many parts will the whole orange be cut into?

12. What is ⅓ of ¼?

13. A boy having ⅓ of a quart of chestnuts, gave away ¼ of what he had. What part of the whole quart did he give away?

14. What is ¼ of ⅓?

15. What is ½ of ⅕?

16. A man owning ⅕ of a ship, sold ⅓ of his share; what part of the ship did he sell, and what part did he then own?

17. What is ⅓ of ⅕?

18. What is ⅕ of ¼?

19. What is $\frac{1}{4}$ of $\frac{1}{5}$?
20. What is $\frac{1}{2}$ of $\frac{1}{6}$?
21. What is $\frac{1}{3}$ of $\frac{1}{7}$?
22. What is $\frac{1}{5}$ of $\frac{1}{8}$?
23. What is $\frac{1}{4}$ of $\frac{1}{7}$?
24. What is $\frac{1}{3}$ of $\frac{1}{8}$?
25. What is $\frac{1}{6}$ of $\frac{1}{5}$?
26. What is $\frac{1}{5}$ of $\frac{1}{7}$?
27. What is $\frac{1}{4}$ of $\frac{1}{6}$?
28. What is $\frac{1}{7}$ of $\frac{1}{9}$?

29. A boy having $\frac{2}{3}$ of an orange, (that is, 2 pieces,) gave his sister $\frac{1}{2}$ of what he had; how many thirds did he give her?

30. What is $\frac{1}{2}$ of $\frac{2}{3}$?

31. A boy having $\frac{3}{4}$ of a pine apple, said he would give one half of what he had to his sister, if she could tell how to divide it. His sister says, you have got $\frac{3}{4}$ or three pieces, if you cut them all in two, you can give me $\frac{1}{2}$ of them. But $\frac{1}{2}$ of $\frac{1}{4}$ is $\frac{1}{8}$, therefore I shall have $\frac{3}{8}$ of the whole pine apple.

32. What is $\frac{1}{2}$ of $\frac{3}{4}$?

33. A man owning $\frac{3}{4}$ of a share in the Boston bank, sold $\frac{1}{3}$ of his part. What part of a share did he sell?

34. What is $\frac{1}{3}$ of $\frac{3}{4}$?

35. A man owning $\frac{4}{5}$ of a ship, sold $\frac{1}{4}$ of his share; what part of the whole ship did he sell? What part had he left?

36. What is $\frac{1}{4}$ of $\frac{4}{5}$?
37. What is $\frac{1}{2}$ of $\frac{4}{5}$?
38. What is $\frac{1}{3}$ of $\frac{6}{7}$?
39. What is $\frac{1}{3}$ of $\frac{2}{7}$?
40. What is $\frac{1}{4}$ of $\frac{4}{7}$?
41. What is $\frac{1}{2}$ of $\frac{3}{7}$?

42. A man owning $\frac{5}{6}$ of a share in the Boston bank, sold $\frac{1}{3}$ of his part; what part of a whole share did he sell?

43. What is $\frac{1}{3}$ of $\frac{5}{6}$?

44. What is $\frac{1}{4}$ of $\frac{4}{7}$?

45. A boy having $\frac{4}{5}$ of a water melon, wished to divide his part equally between his sister, his brother, and himself, but was at a loss to know how to do it; but his sister advised him to cut each of the fifths into 3 equal parts. How many pieces did each have? and what part of the whole melon was each piece?

46. What is $\frac{1}{3}$ of $\frac{4}{5}$?

47. What is $\frac{1}{5}$ of $\frac{3}{4}$?

48. What is $\frac{1}{8}$ of $\frac{4}{5}$?

49. What is $\frac{1}{9}$ of $\frac{5}{7}$?

50. What is $\frac{1}{10}$ of $\frac{4}{9}$?

51. What is $\frac{1}{3}$ of $\frac{1}{4}$?

52. What is $\frac{2}{3}$ of $\frac{1}{4}$?

53. What is $\frac{1}{4}$ of $\frac{2}{3}$?

54. What is $\frac{3}{4}$ of $\frac{2}{3}$?

55. What is $\frac{1}{3}$ of $\frac{2}{5}$?

56. What is $\frac{2}{3}$ of $\frac{2}{5}$?

57. What is $\frac{1}{3}$ of $\frac{5}{6}$?

58. What is $\frac{2}{3}$ of $\frac{5}{6}$?

59. What is $\frac{5}{6}$ of $\frac{2}{3}$?

60. What is $\frac{2}{7}$ of $\frac{4}{5}$?

61. What is $\frac{3}{8}$ of $\frac{2}{3}$?

62. What is $\frac{1}{9}$ of $\frac{3}{7}$?

63. What is $\frac{4}{9}$ of $\frac{3}{7}$?

64. What is $\frac{1}{10}$ of $\frac{3}{8}$?

65. What is $\frac{7}{10}$ of $\frac{3}{8}$?

66. What is $\frac{5}{8}$ of $\frac{3}{10}$?

67. What is $\frac{7}{8}$ of $\frac{2}{9}$?

68. What is $\frac{5}{9}$ of $\frac{3}{7}$?

69. If a yard of cloth cost $2\frac{1}{2}$ dollars, what will $\frac{1}{2}$ of a yard cost?

70. What is $\frac{1}{2}$ of $2\frac{1}{2}$?

71. A boy had $2\frac{1}{2}$ oranges, and wished to give $\frac{1}{3}$ of them to his sister, and $\frac{1}{3}$ to his brother, but he

did not know how to divide them equally. His brother told him to cut the whole into halves, and then cut each of the halves into 3 pieces. What part of a whole orange did each have?

72. What is $\frac{1}{3}$ of $2\frac{1}{2}$?

73. A man bought 4 bushels of corn for $3\frac{2}{3}$ dollars; what part of a dollar did 1 bushel cost?

Change the $3\frac{2}{3}$ *to thirds, and then find* $\frac{1}{4}$ *of* $\frac{11}{3}$ *as above.*

74. What is $\frac{1}{4}$ of $5\frac{2}{3}$?

75. If 5 bushels of wheat cost $7\frac{3}{4}$ dollars, what is that a bushel?

76. What is $\frac{1}{5}$ of $7\frac{3}{4}$?

77. A man bought 6 gallons of brandy for $8\frac{2}{5}$ dollars; what was that a gallon?

78. What is $\frac{1}{6}$ of $8\frac{2}{5}$?

79. A man bought 7 gallons of wine for $8\frac{4}{7}$ dollars; how much was that a gallon?

80. What is $\frac{1}{7}$ of $8\frac{4}{7}$?

81. A man bought 10 pieces of nankin for $6\frac{3}{8}$ dollars; how much was it a piece?

82. What is $\frac{1}{10}$ of $6\frac{3}{8}$?

83. If 9 bushels of rye cost $7\frac{3}{5}$ dollars, what is that a bushel?

84. What is $\frac{1}{9}$ of $7\frac{3}{5}$?

85. What is $\frac{1}{8}$ of $5\frac{3}{7}$?

86. What is $\frac{1}{3}$ of $8\frac{4}{9}$?

87. What is $\frac{1}{4}$ of $6\frac{3}{10}$?

88. What is $\frac{1}{5}$ of $9\frac{4}{7}$?

89. A man bought 7 yards of cloth for $18\frac{3}{5}$ dollars; what was that a yard? What would 3 yards cost at that rate?

90. What is $\frac{1}{7}$ of $18\frac{3}{5}$? What is $\frac{3}{7}$ of $18\frac{3}{5}$?

91. A man bought 5 barrels of cider for $27\frac{3}{8}$ dollars; what was it a barrel? What would 7 barrels cost at that rate?

92. What is $\frac{1}{5}$ of $27\frac{3}{8}$? What is $\frac{7}{5}$ of $27\frac{3}{8}$?

93. If 6 barrels of flour cost $38\frac{4}{5}$ dollars, what would 10 barrels cost at that rate?

94. What is $\frac{10}{6}$ of $38\frac{4}{5}$?

B. 1. A man bought a piece of cloth for $42\frac{3}{7}$ dollars, and was obliged to sell it for $\frac{4}{5}$ of what it cost him; how much did he lose?

2. A man bought a quantity of flour for $53\frac{3}{7}$ dollars, and sold it for $\frac{9}{8}$ of what it cost him; how much did he gain?

3. If 7 men can do a piece of work in $4\frac{2}{5}$ days, how long will it take 1 man to do it? How long will it take 3 men to do it?

4. If 4 men can do a piece of work in $9\frac{3}{7}$ days, how long would it take to do it, if 7 men were employed?

5. There is a pole standing so that $\frac{3}{7}$ of it is in the water, and $\frac{2}{3}$ as much in the mud; how much is in the mud?

6. If a man can travel $13\frac{5}{9}$ miles in 3 hours, how many miles will he travel in 8 hours?

7. If 5 horses will eat $26\frac{7}{8}$ loads of hay in a year, what will 8 horses eat in the same time?

8. If 4 cocks will empty a cistern in $6\frac{5}{6}$ hours, how long will it take 7 cocks of the same size to empty it?

◆

SECTION XV.

A. 1. A BOY having 2 oranges wished to give $\frac{1}{3}$ of an orange apiece to his playmates; how many could he give them to? If he had given $\frac{2}{3}$ of an orange apiece, how many could he have given them to?

2. How many times $\frac{1}{3}$ are there in 2? How many times $\frac{2}{3}$ are there in 2?

3. A man having 3 bushels of corn distributed it among some poor persons, giving them $\frac{3}{4}$ of a bushel each; to how many did he give it?

Note. Find first how many he would have given it to, if he had given $\frac{1}{4}$ of a bushel to each.

4. In 3 are how many times $\frac{1}{4}$? How many times $\frac{3}{4}$?

5. If $\frac{2}{5}$ of a barrel of flour will last a family one month, how long will 4 barrels last the same family? How long will 6 barrels last? How long will 10 barrels last?

6. How many times is $\frac{2}{5}$ contained in 4? How many times in 6? How many times in 10?

7. If $\frac{3}{4}$ of a bushel of wheat will last a family one week, how many weeks will $6\frac{3}{4}$ bushels last the same family?

8. How many times is $\frac{3}{4}$ contained in $6\frac{3}{4}$?

9. There is a cistern having a cock which will fill it in $\frac{2}{5}$ of an hour; how many times would the cock fill the cistern in $3\frac{2}{5}$ hours?

10. How many times is $\frac{2}{5}$ contained in $3\frac{2}{5}$?

11. How much cloth at $1\frac{1}{2}$ dollars (that is $\frac{3}{2}$ dollars) a yard can be bought for 4 dollars?

12. How many times is $1\frac{1}{2}$ or $\frac{3}{2}$ contained in 4?

13. A man distributed $8\frac{1}{2}$ bushels of wheat among some poor persons, giving $1\frac{1}{2}$ bushels to each; how many did he give it to?

14. How many times is $1\frac{1}{2}$ contained in $8\frac{1}{2}$?

15. If a soldier is allowed $1\frac{1}{3}$ pounds (that is $\frac{4}{3}$ of a pound) of meat in a day, to how many soldiers would $6\frac{2}{3}$ pounds be allowed?

16. How many times is $1\frac{1}{3}$ contained in $6\frac{2}{3}$?

17. If $1\frac{2}{3}$ tons of hay will keep a horse through the winter, how many horses will 10 tons keep?

18. How many times is $1\frac{2}{3}$ contained in 10?

19. At $2\frac{1}{3}$ dollars a box, how many boxes of raisins can be bought for 10 dollars?

20. How many times is $2\frac{1}{3}$ contained in 10?

21. At $1\frac{3}{5}$ dollars a pound, how many pounds of indigo can be bought for $9\frac{3}{5}$ dollars ?

22. How many times is $1\frac{3}{5}$ contained in $9\frac{3}{5}$?

23. At $1\frac{4}{7}$ dollars a barrel, how many barrels of raisins can be bought for $9\frac{3}{7}$ dollars ?

24. How many times is $1\frac{4}{7}$ contained in $9\frac{3}{7}$?

25. At $\frac{7}{8}$ of a dollar apiece, how many pieces of nankin can be bought for $8\frac{3}{8}$ dollars ?

26. How many times is $\frac{7}{8}$ contained in $8\frac{3}{8}$?

27. At $\frac{5}{9}$ of a dollar a pound, how many pounds of tea can be bought for $7\frac{2}{9}$ dollars ?

28. How many times is $\frac{5}{9}$ contained in $7\frac{2}{9}$?

29. How many times is $3\frac{1}{3}$ contained in $7\frac{2}{3}$?

30. How many times is $5\frac{1}{2}$ contained in 17 ?

31. How many times is $4\frac{1}{5}$ contained in $9\frac{3}{5}$?

32. How many times is $3\frac{3}{7}$ contained in $12\frac{4}{7}$?

B. 1. At $\frac{1}{10}$ of a dollar a pound, how many pounds of meat can be bought for $\frac{1}{2}$ of a dollar ?

Note. Change $\frac{1}{2}$ *to tenths.*

2. How many times is $\frac{1}{10}$ contained in $\frac{1}{2}$?

3. A man having $\frac{3}{4}$ of a barrel of flour distributed it among some poor persons, giving them $\frac{1}{6}$ of a barrel apiece ; how many did he give it to ?

Note. Change both fractions to twelfths ; that is, reduce them to a common denominator.

4. How many times is $\frac{1}{6}$ contained in $\frac{3}{4}$?

5. If a pound of almonds cost $\frac{1}{7}$ of a dollar, how many pounds can be bought for $\frac{2}{3}$ of a dollar ?

Note. Reduce the fractions to a common denominator.

6. How many times is $\frac{1}{7}$ contained in $\frac{2}{3}$?

7. If a piece of nankin cost $\frac{2}{3}$ of a dollar, how many pieces can be bought for $4\frac{3}{4}$ dollars ? that is $\frac{19}{4}$ dollars ?

8. How many times is $\frac{2}{3}$ contained in $4\frac{3}{4}$?

9. If a bushel of barley cost $\frac{2}{5}$ of a dollar, how

many bushels can be bought for $\frac{7}{8}$ of a dollar? How many for $1\frac{5}{8}$ dollars?

10. How many times is $\frac{3}{5}$ contained in $\frac{7}{8}$? How many times in $1\frac{5}{8}$?

11. How many times is $\frac{3}{7}$ contained in $\frac{2}{3}$?

12. How many times is $\frac{2}{9}$ contained in $\frac{5}{6}$? $3\frac{3}{4}$

TABLES OF COINS, WEIGHTS, AND MEASURES.

Table I.—Federal Money.

10 mills	make	1 cent.
10 cents	"	1 dime.
10 dimes	"	1 dollar.
10 dollars	"	1 eagle.

Table II.—Sterling Money.

4 farthings q.	make	1 penny.	d.
12 pence	"	1 shilling.	s.
20 shillings	"	1 pound	£.
6 shillings	"	1 dollar.	
28 shillings	"	1 guinea.	

Table III.—Troy Weight.

24 grains gr.	make	1 pennyweight.	dwt.
20 pennyweights	"	1 ounce.	oz.
12 ounces	"	1 pound.	lb.

Table IV.—Avoirdupois Weight.

16 drams dr.	make	1 ounce.	oz.
16 ounces	"	1 pound.	lb
28 pounds	"	1 quarter of a hundred weight.	qr.

4 quarters	make	1 hundred weight.	cwt.
20 hundred weight	"	1 ton.	T.

Table V.—Cloth Measure.

2¼ inches	make	1 nail.	nl.
4 nails	"	1 quarter of a yard.	qr.
4 quarters	"	1 yard.	y.
3 quarters	"	1 ell Flemish.	
5 quarters	"	1 ell English.	
6 quarters	"	1 aune or ell French.	

Table VI.—Wine Measure.

4 gills	make	1 pint.	pt.
2 pints	"	1 quart.	qt.
4 quarts	"	1 gallon.	gal.
31½ gallons	"	1 barrel.	bar.
63 gallons	"	1 hogshead.	hd.
2 hogshead	"	1 pipe.	
2 pipes	"	1 tun.	

Table VII.—Dry Measure.

2 pints	make	1 quart.	qt.
8 quarts	"	1 peck.	pk.
4 pecks	"	1 bushel.	bu.

Table VIII.—Measure of Time.

60 seconds	sec.	make	1 minute.	min.
60 minutes		"	1 hour.	h.
24 hours		"	1 day.	d.
7 days		"	1 week.	w.
4 weeks		"	1 month.	m
13 months 1 day and 6 hours, or 365 days and 6 hours		"	1 year.	yr.

For convenience of reckoning, it is usual in calendars to call the year 365 days for 3 successive years, and every fourth year 366, (for in 4 years the six hours overplus amount to a day) which is called bissextile or leap year. This day is added to February.

The common year is divided into twelve months, which are sometimes called *calendar* months, because they are the months used in calendars.

The names of the months, and the number of days in each, are as follows:

		Names.	Number of days.
Winter.	1.	January	31
	2.	February	28, in leap year 29.
Spring.	3.	March	31
	4.	April	30
	5.	May	31
Summer.	6.	June	30
	7.	July	31
	8.	August	31
Autumn.	9.	September	30
	10.	October	31
	11.	November	30
Winter.	12.	December	31

Miscellaneous Examples.

1. In 2 pounds how many ounces ?
2. In 8 yards how many quarters ?
3. In 3 quarters of a yard how many nails ?
4. $\frac{3}{10}$ of a dollar is how many cents ?
5. How many farthings is $\frac{3}{5}$ of a penny ?
6. How many pence is $\frac{5}{6}$ of a shilling ?
7. $\frac{3}{5}$ of a yard is how many quarters and nails ?

8. In $\frac{3}{7}$£ how many shillings? [illegible] 4/7

9. How much is $\frac{4}{9}$ of a shilling? [illegible]

10. How much is $\frac{4}{5}$ of a bushel of wheat?

11. How much would $\frac{3}{8}$ of a barrel of wine cost, at one dollar a gallon? 5 1/4

12. How much would $\frac{1}{8}$ cwt. of sugar cost, at 8 cents a pound? [illegible]

13. How much is $\frac{5}{8}$ of a day? [illegible]

14. How much is $\frac{3}{5}$ of a day?

15. How much is $\frac{3}{5}$ of a week?

16. How much is $\frac{2}{7}$ of an hour?

17. How much would $\frac{3}{9}$ of a hogshead of wine cost, at 2 dollars a gallon?

18. If a man spend 28 dollars in a month, what is that a week? How much a day?

19. If a man spend 16 dollars a week, what is that a day?

20. If a man buy 4 bushels of grain for 5 dollars, how much is that a bushel?

21. If wine is 2 dollars a gallon, how much is that a pint?

22. If you give 5 cents a gill for wine, what is that a pint? What is it a quart? What is it a gallon?

23. If wine is worth 20 cents a pint, what is that a gill? What is it a quart? What is it a gallon?

24. If a yard of cloth is worth 7 dollars, what are $2\frac{3}{8}$ yards worth?

25. If a man earn 11 dollars a week, what is that a day? What for 3 days? What for $4\frac{1}{2}$ days?

26. If a man earn $2\frac{3}{5}$ dollars in a day, what will he earn in a week?

27. What is $\frac{5}{7}$ of a hogshead of wine? 45

28. 1 farthing is what part of a penny?

29. 2 farthings is what part of a penny?

30. 3 farthings is what part of a penny?

31. 1 penny is what part of a shilling?

32. 2 pence is what part of a shilling ?
33. 3 pence is what part of a shilling?
34. 5 pence is what part of a shilling ?
35. 6 pence is what part of a shilling ?
36. 7 pence is what part of a shilling ?
37. 8 pence is what part of a shilling?
38. 9 pence is what part of a shilling ?
39. 10 pence is what part of a shilling ?
40. 11 pence is what part of a shilling ?
41. 1 shilling is what part of a pound ?
42. 2 shillings is what part of a pound ?
43. 3 shillings is what part of a pound ?
44. 4 shillings is what part of a pound ?
45. 5 shillings is what part of a pound ?

46. What part of a pound is 6 shillings ? 7 shillings ? 8 shillings ? 9 shillings ? 10 shillings ? 11 shillings ? 12 shillings ? 13 shillings ? 14 shillings ? 15 shillings ? 16 shillings ? 17 shillings ? 18 shillings ? 19 shillings ?

47. How many farthings are there in a shilling ?

48. One farthing is what part of a shilling ?

49. 2 farthings is what part of a shilling ? 3 farthings ? 4 farthings ? 5 farthings ? 6 farthings ? 7 farthings ? 8 farthings ? 9 farthings ? 10 farthings ?

50. How many pence are there in a pound ?

51. One penny is what part of a pound ?

52. What part of a pound is 2 pence ? 3 pence ? 4 pence ? 5 pence ? 6 pence ? 7 pence ? 8 pence ? 11 pence ? 15 pence ? 27 pence ? 35 pence ?

53. How many pence are there in 1 shilling and 6 pence ?

54. In 2 shillings and 4 pence, how many pence ?

55. In 4 shillings and 5 pence, how many pence ?

56. In 5 shillings and 8 pence, how many pence ?

57. In 9 shillings and 11 pence, how many pence ?

58. What part of 1£ is 2s. 6d. ?

59. 3s. 5d. is what part of 1£ ?

Note. Reduce the whole to pence.

60. 7s. 8d. is what part of 1£ ?

61. What is the price of 2 yards of cloth, at 3s. 4d. a yard ?

62. What will 8 yards of cloth cost, at 2s. 8d. a yard ?

63. What will 4 bushels of wheat cost, at 5s. 9d. a bushel ?

64. What must you give for 4 barrels of cider, at 2¼ dollars a barrel ?

65. If 3 bushels of wheat be divided between 2 men, how much would they have apiece ?

66. If 4 bushels of corn be divided among 5 men, how much would they have apiece ?

67. If 3 bushels of corn be divided among 7 men, how much would they have apiece ?

68. How many nails are there in 1 yard ?

69. How many nails are there in 4 yards ?

70. How many nails are there in 5 yards and 2 nails ?

71. In 7 yards and 3 quarters, how many quarters.

72. In 4 yards, 2 quarters, and 3 nails, how many nails ?

73. 1 nail is what part of a quarter ?

74. 3 nails is what part of a quarter ?

75. 1 nail is what part of a yard ?

76. What part of 1 yard is 3 nails ? 5 nails ? 7 nails ? 10 nails ? 15 nails ?

77. In 8 quarters of a yard how many yards ?

78. In 12 quarters of a yard how many yards ?

79. In 10 quarters of a yard how many yards ?

80. In 15 quarters of a yard how many yards ?

81. In 12 nails how many quarters of a yard ?

82. In 16 nails how many quarters of a yard ? How many yards ?

83. In 24 nails how many quarters of a yard ? How many yards ?

84. In 35 quarters of a yard how many yards?

85. In 45 nails how many yards?

86. In 63 nails how many yards?

87. At 2 cents a nail what would 4 yards of cloth cost?

88. At $2\frac{2}{3}$ dollars for 1 quarter of a yard what would 2 yards cost?

89. 1 oz. is what part of a lb.?

90. What part of a lb. is 2 oz.? 3 oz.? 4 oz.? 5 oz.? 7 oz.? 10 oz.? 15 oz.?

91. What part of a qr. of 1 cwt. is 1 lb.? 2 lbs.? 3 lbs.? 4 lbs.? 7 lbs.? 9 lbs.? 14 lbs.? 18 lbs.? 23 lbs.?

92. At 3 cents for 1 oz. what would 1 lb. cost?

93. At 3 cents for 2 oz. what would 1 lb. cost?

94. At 3 cents for 8 oz. what would 1 lb. cost?

95. At 5 cents for 10 oz. what would 1 lb. cost?

96. At 8 shillings for 4 lbs. what would 10 lbs. cost?

97. If a man consume 1 lb. and 3 oz. of meat in a day, how much would he consume in a week?

98. If a man spend $2\frac{3}{5}$ dollars in a day, how much would he spend in a week?

99. If a man travel $3\frac{2}{7}$ miles in an hour, how far would he travel in 3 hours? how far in 7 hours? how far in 12 hours?

100. If 2 men start from the same place, and travel in opposite directions; one at the rate of $3\frac{3}{5}$ miles in an hour, and the other $4\frac{1}{5}$ miles; how far will they be apart at the end of 1 hour? how far at the end of 2 hours? how far at the end of 3 hours? how far at the end of 7 hours?

101. Two men start from the same place, and travel the same wey; one at the rate of $4\frac{1}{7}$ miles in an hour, the other at the rate of $4\frac{6}{7}$ miles in an hour; how far will they be apart at the end of 1 hour? how far in 2 hours? how far in 5 hours? how far in

10 hours? how far in 3 days, if they travel 10 hours in a day? 37

102. How many yards of cloth, at 5 dollars a yard, must be given for 8 barrels of flour, at 7 dollars per barrel?

103. What part of a month is 1 week? 2 weeks? 3 weeks?

104. What part of a year is 1 month? 2 months? 3 months? 4 months? 5 months? 6 months? 7 months? 8 months? 9 months? 10 months? 11 months?

105. What part of 1 month is 1 day? 2 days? 3 days? 7 days? 8 days? 11 days? 15 days? 18 days? 20 days? 24 days? 27 days?

106. If 5 bushels of oats will keep 7 horses through the winter, how many bushels will it take to keep 12 horses the same time?

107. If you give 7 men $2\frac{1}{5}$ bushels of corn apiece, how many bushels would it take for the whole?

108. A man failing in trade was able to pay his creditors only 4 shillings on a dollar; how much would he pay on 2 dollars? how much on 3 dollars? how much on 7 dollars? how much on 10 dollars?

109. A man failing in trade is able to pay only 9 shillings on a pound; how much would he pay on a debt of 2 pounds? how much on 3 pounds? how much on 12 pounds?

110. A man failing in trade is able to pay only 4 shillings and 7 pence on a dollar; how much would he pay on a debt of 7 dollars?

111. If 6 dollars worth of provisions will serve 3 men 5 days, how many days will it serve 1 man? how many days will it serve 2 men? how many days will it serve 8 men?

112. If 10 dollars worth of provision will serve 7 men 4 days, how many days will it serve 9 men?

113. If 12 dollars' worth of provision will serve 7

men 3 days; how many men would it serve 1 day? how many 2 days? how many 8 days?

114. If 11 dollars' worth of provision will serve 6 men 8 days; how many men will it serve 5 days?

115. If 8 dollars' worth of provision will serve 7 men 5 days; how many days would 16 dollars' worth of provision last 4 men?

116. If 1 peck of wheat afford 12 ten-penny loaves, how many penny loaves may be obtained from it? how many two-penny loaves? how many three-penny loaves? how many seven-penny loaves?

117. If 1 peck of wheat afford 11 eight penny loaves; how many ten-penny loaves will it afford?

118. A man having hired some men and some boys, agreed to give each man 3 shillings, and each boy 2 shillings; how much would it take to pay a man and a boy? how much 2 men and 2 boys? how much 7 men and 7 boys?

119. A man having 18 shillings to pay among his labourers, would give to every man 2 shillings, and to every boy 1 shilling? the number of men and boys was equal; how many were there of each?

120. A gentleman having 50 shillings to pay among his labourers, would give to every man 8 pence, and to every boy 4 pence; the number of men and boys was equal; how many were there of each?

121. Two men bought a bushel of corn, one gave 1 shilling, the other 2 shillings; what part of the whole did each pay? What part of the corn must each have?

122. Two men bought a barrel of flour for 8 dollars; one gave 3 dollars, the other 5 dollars, what part did each pay? and what part must each have?

123. Three men, A, B, and C, hired a garden; A paid 6 dollars, B 5 dollars, and C 9 dollars; how

much did they all pay? What part of the whole did each pay? They sold the produce for 40 dollars; what part of it must each have? What did each one's share amount to? [illegible] 10. 6 14

124. Three men bought a lottery ticket for 10 dollars; the first gave 3 dollars, the second 5 dollars, and the third 2 dollars. They drew a prize of 120 dollars. What was each man's share? 36.60.24

125. Two men hired a pasture for 58 dollars; one put in 7 horses, and the other 3 horses; what ought each to pay? 40 3/5 17 2/5

126. Three men commenced trade together; they put in money in the following proportion; the first, 3 dollars, as often as the second put in 4, and as often as the third put in 5; they gained 87 dollars. What was each man's share of the gain? 21 3/4. 29. 36

127. Two men hired a pasture for 32 dollars. The first put in 3 sheep for four months, the second put in 4 sheep for five months; how much ought each to pay? [illegible]

Note. Three sheep for four months is the same as 12 sheep for 1 month, 4 sheep for 5 months is the same as 20 sheep for 1 month. This question is therefore the same as if 1 man put in 12 sheep, and the other 20 sheep.

128. Two men, A and B, traded in company; A put in 1 dollar for 4 months, and B 2 dollars for 3 months, and they gained ninety cents; how many cents must each have? 36 [illegible] 54 [illegible]

129. Three men, A, B, and C, traded in company; and put in money in the following proportions; A put in 4 dollars as often as B put in 3, and as often as C put in 2; A's money was in 2 months, B's 3 months, and C's 4 months, and they gained 100 dollars; what was each one's share?

130. Two men, A and B, traded in company; A put in 2 dollars as often as B put in 3; A's money

was employed 7 months, and B's money 5 months; they gained 58 dollars; what was each man's share of the gain? 28. 8. 3

131. Three men, A, B, and C, traded in company, and put in money in the following proportions; A put in 2 dollars as often as B put in 4, and as often as C put in 6. B's money was in twice as long as C's, and A's three times as long as B's: they gained 88 dollars; what was each one's share of the gain?

NOTE. *Interest is a reward or premium allowed by a debtor to a creditor for the use of money. The usual interest for* 1 *year, and that which is established by law in this country, is* 6 *cents on a dollar,* 6 *dollars on a hundred dollars, or* 6 *pounds on a hundred pounds, or in fine* $\frac{6}{100}$ *of the sum whatever be the denomination. It is called* 6 *per cent., that is* 6 *on the hundred, because it is always reckoned by the hundred. So* 3 *per cent.,* 4 *per cent., &c. signify* $\frac{3}{100}$, $\frac{4}{100}$, *&c. or so much on a hundred.*

132. The interest of 1 dollar being 6 cents for 1 year, what is the interest of 7 dollars for the same time? What is the interest of 10 dollars? Of 15 dollars? Of 20 dollars? Of 30 dollars? Of 50 dollars? Of 75 dollars? Of 100 dollars? Of 118 dollars?

133. If the interest of 1 dollar is 6 cents for 1 year, what would it be for 2 years? What would be the interest of 8 dollars for two years? Of 17 dollars? Of 43 dollars?

134. If the interest of 100 dollars is 6 dollars for a year, what would be the interest of 50 dollars for the same time? Of 2 hundred? Of 3 hundred? Of 4 hundred? Of 1 hundred and 50? Of 2 hundred and 50?

135. If the interest of 100 dollars is 6 dollars for 1 year, what would be the interest of it for 6 months? For 3 months? For 4 months? For 8

months? For 9 months? For 1 month? For 2 months? For 5 months? For 7 months? For 10 months? For 11 months?

136. What is the interest of 100 and 32 dollars for 2 years, at 6 per cent.?

137. What is the interest of 300 dollars for 1 year and 6 months, at 6 per cent.?

138. What is the interest of 1 dollar for 6 months at 6 per cent.? What for 2 months? What for 1 month? What for 3 months? 4 months? 5 months? 7 months? 9 months? 11 months?

139. What is the interest of 57 dollars for 1 year and 7 months, at 6 per cent.?

140. What is the interest of 200 and 67 dollars for 1 year and 4 months, at 6 per cent.?

141. If the interest of 1 year is 6 per cent., what would be the per cent. for 2 years? For 3 years? For 6 months? For 2 months? For 1 month? For 4 months? For 5 months? For 7 months? For 8 months? For 9 months?

142. If the interest of 2 months or 60 days is 1 per cent., what would be the per cent. for 20 days? What for 40 days? What for 15 days? What for 45 days? What for 12 days? What for 10 days? What for 5 days?

143. What is the interest of 100 and 37 dollars for 2 years 3 months and 20 days?

144. A can do a piece of work in 2 days; how much of it can he do in 1 day?

145. B can do a piece of work in 4 days; how much of it can he do in 1 day?

146. If A can do $\frac{1}{2}$ of a piece of work in 1 day, and B can do $\frac{1}{4}$ of it in 1 day, how much would both do in a day? How long would it take them both together to do the whole?

147. If 1 man can do a piece of work in 2 days, and another in 3 days, how much of it would each

do in a day ? How much would both together do ? How long would it take them both to do the whole ?

148. A cistern has 2 cocks ; the first will fill it in 3 hours, the second in 6 hours ; how much of it would each fill in an hour ? How much would both together fill ? How long would it take them both to fill it ?

149. A man and his wife found by experience, that, when they were both together, a bushel of meal would last them only 2 weeks ; but when the man was gone, it would last his wife 5 weeks. How much of it did both together consume in 1 week ? What part did the woman alone consume in 1 week ? What part did the man alone consume in 1 week ? How long would it last the man alone ?

150. If 1 man could build a piece of wall in 5 days, and another man could do it in 7 days, how much of it would each do in 1 day ? How many days would it take them both to do it ?

151. A cistern has 3 cocks ; the first would fill it in 3 hours ; the second in 6 hours ; the third in 4 hours ; what part of the whole would each fill in 1 hour ? and how long would it take them all to fill it, if they were all running at once ?

152. A and B together can build a boat in 8 days, and with the assistance of C they can do it in 5 days ; how much of it can A and B build in 1 day ? how much of it can A, B, and C, build in 1 day ? how much of it can C build alone in 1 day ? how long would it take C to build it alone ?

153. Suppose I would line 8 yards of broadcloth that is $1\frac{1}{2}$ yards wide, with shalloon that is $\frac{3}{4}$ of a yard wide ; how many yards of the shalloon will line 1 yard of the broadcloth ? how many yards will line the whole ?

154. If 7 yards of cloth cost 13 dollars, what will 10 yards cost ?

155. If the wages of 25 weeks come to 75 dollars, what will be the wages of seven weeks? 21

156. If 8 tons of hay will keep 7 horses three months, how much will keep 12 horses the same time? 13 5/7

157. If a staff 4 feet long cast a shadow 6 feet long, what is the length of a pole that casts a shadow 58 feet at the same time of day? 38 2/3

158. If a stick 8 feet long cast a shadow 2 feet in length, what is the height of a tree which casts a shadow 42 feet at the same time of day? 168

159. At 6 dollars per week, how many months' board can I have for 100 dollars? 4 1/6

160. A ship has sailed 24 miles in 4 hours; how long will it take her to sail 150 miles at the same rate? 25 h

161. 30 men can perform a piece of work in 20 days; how many men will it take to perform the same work in 8 days? 75

162. 17 men can perform a piece of work in 25 days; in how many days would 5 men perform the same work? 85 d

163. A hare has 76 rods the start of a greyhound, but the greyhound runs 15 rods to ten of the hare; how many rods must the greyhound run to overtake the hare? [illegible]

164. A garrison has provision for 8 months, at the rate of 15 ounces per day; how much must be allowed per day, in order that the provision may last 11 months? 10 [illegible]

165. If 8 men can build a wall 15 rods in length in 10 days, how many men will it take to build a wall 45 rods in length in 5 days? 4[illegible]

166. If a quarter of wheat affords 60 ten-penny loaves, how many eight-penny loaves may be obtained from it?

167. Said Harry to Dick, my purse and money

together are worth 16 dollars, but the money is worth 7 times as much as the purse; how much money was there in the purse? and what is the value of the purse?

168. A man being asked the price of his horse, answered, that his horse and saddle together were worth 100 dollars, but the horse was worth 9 times as much as the saddle. What was each worth?

169. A man having a horse, a cow, and a sheep, was asked what was the value of each. He answered, that the cow was worth twice as much as the sheep, and the horse 3 times as much as the sheep, and that all together were worth 60 dollars. What was the value of each?

170. A man bought an apple, an orange, and a melon, for 21 cents; for the orange he gave twice as much as for the apple, and for the melon he gave twice as much as for the orange. How much did he give for each?

171. If 80 dollars worth of provision will serve 20 men 24 days, how many days will 100 dollars' worth of provision serve 30 men?

172. There is a pole ½ and ⅓ under water, and 10 feet out; how long is the pole?

173. In an orchard of fruit trees, ½ of them bear apples, ¼ of them bear plums, ⅛ of them pears, 7 of them peaches, and 3 of them cherries; how many trees are there in the whole and how many of each sort?

174. A farmer being asked how many sheep he had, answered, that he had them in 4 pastures; in the first he had ⅓ of his flock; in the second ¼; in the third ⅙; and in the fourth 15; how many sheep had he?

175. A man driving his geese to market, was met by another, who said, good morrow, master, with your hundred geese; says he, I have not a

hundred; but if I had half as many more as I now have, and two geese and a half, I should have a hundred; how many had he? 65

176. What number is that, to which if its half be added the sum will be 60? 40

177. What number is that, to which if its third be added the sum will be 48? 36

178. What number is that, to which if its fifth be added the sum will be 54? 45

179. What number is that, to which if its half and its third be added the sum will be 55? 30

180. A man being asked his age, answered, that if its half and its third were added to it, the sum would be 77; what was his age? 42

181. What number is that, which being increased by its half, its fourth, and eighteen more, will be doubled? 72

182. A boy being asked his age, answered, that if ½ and ¼ of his age, and 20 more were added to his age, the sum would be 3 times his age. What was his age? [illegible]

183. A man being asked how many sheep he had, answered, that if he had as many more, ½ as many more, and 2½ sheep, he should have 100. How many had he? 39

ARITHMETIC.

PART II.

KEY.

The Key contains an explanation of the plates, and the manner of using them. The manner of solving the examples in each section is particularly explained. All the most difficult of the practical examples are solved in such a manner, as to show the principles by which they are performed. Care has been taken to select examples for solution, that will explain those which are not solved. Many remarks with regard to the manner of illustrating the principles to the pupils, are inserted in their proper places.

Instructers who may never have attended to fractions, need not be afraid to undertake to teach this book. The author flatters himself that the principles are so illustrated, and the processes are made so simple, that any one, who shall undertake to teach it, will find himself familiar with fractions before he is aware of it, although he knew nothing of them before; and that every one will acquire a facility in solving questions, which he never before possessed.

The reasoning used in performing these small examples is precisely the same, as that used upon large ones. And when any one finds a difficulty in solving a question, he will remove it much sooner, and much more effectually, by taking a very small example of the same kind, and observing how he does it, than by recurring to a rule.

The practical examples at the commencement of each section and article, are generally such as to show the pupil what the combination is, and how he is to perform it. This will learn the pupil gradually to reason upon abstract numbers. In each combination, there are a few abstract examples without practical ones, to exercise the learner in the combinations, after he knows what these combinations are. It would be an excellent exercise for the pupil to put these into a practical form when he is reciting. For instance when the question is, how many are 5 and 3. Let him make a question in this way; if an orange cost 5 cents, and an apple 3 cents, what would they both come to? This may be done in all cases.

The examples are often so arranged, that several depend on each other, so that the preceding explains the following one. Sometimes also in the same example, there are several questions asked, so as to lead the pupil gradually from the simple to the more difficult. It would be well for the pupil to acquire the habit of doing this for himself, when difficult questions occur.

The plates should be used for young pupils, but they are not necessary for the older ones. The plates for fractions however will frequently be useful to these. The first plate need not be used much, after the pupil is familiar with the multiplication table.

The book may be used in classes where it is convenient. The pupil may answer the questions with the book before him or not, as the instructer thinks proper. A very useful mode of recitation is, for the instructer to read the example to the whole class, and then, allowing sufficient time for them to perform the question, call upon some one to answer it. In this manner every pupil will be obliged to perform the example, because they do not know who is to answer it. In this way it will be best for them to answer without the book.

It will often be well to let the elder pupils hear the younger. This will be a useful exercise for them, and an assistance to the instructer.

Explanation of Plate I.

This plate, viewed horizontally, presents ten rows of rectangles, and in each row ten rectangles.

In the first row, each rectangle contains one mark, each mark representing unity or one. In the second row each rectangle contains two marks, in the third, three marks, &c.

The purpose of this plate is, first, to represent unity either as a unit, or as making a part of a sum of units. Secondly, to represent a collection of units, either as forming a unit itself, or as making a part of another collection of units; and thus to compare unity and each collection of units with another collection, in order to ascertain their ratios.

All the examples, as far as the eighth section, can be solved by this plate. The manner of using it is explained in the key for each section in its proper place.

The pupil, if very young, should first be taught to count the units, and to name the different assemblages of units in the following manner:

The instructer showing him the first row, which contains ten units insulated, requests the pupil to put his finger on the first, and say *one;* then on the second and say, *and one are two*, and on the third and say, *and one are three*, and so on to ten; then commencing the row again, let him continue and say, *ten and one are eleven, &c.*

After adding them, let him begin with ten, and say, *ten less one are nine, nine less one are eight, &c.* Then taking larger numbers, as twenty or thirty, let him subtract them in the same manner.

Next let him name the different assemblages, as twos, threes, &c. Afterwards, let him count the number of units in each row.

Note. The sections, articles, and examples, are referred to by the same marks which distinguish them in Part I.

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SECTION I.

A. This section contains addition and subtraction. The first examples may be solved by means of beans, peas, &c. or by plate I. The former method is preferable, if the pupil be very young, not only for the examples in the first part of this section, but for the first examples in all the sections.

The pupil will probably solve the first examples without any instruction.

Examples in addition and subtraction may be solved by plate I. as follows.

How many are 5 and 3?* Select a rectangle containg 5 marks, and another containing 3 marks, and ascertain the number of marks in both.

How many are 8 and 6? Select a rectangle containing 8 marks, and another containing 6 marks, and count them together.

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* Figures are used in the key, because the instructer is supposed to be acquainted with them. They are not used in the first part of the book, because the pupil would not understand them so well as he will the words.

How many are 17 and 5? Keeping 17 in the mind, select a rectangle containing 5 marks, and add them thus: 17 and 1 are 18, and 1 are 19, and 1 are 20, and 1 are 21, and 1 are 22.

If you take 4 from 9, how many will remain? Select a rectangle containing 9 marks, and take away four of them.

18 less 5 are how many? Keeping 18 in mind, select a rectangle containing 5, and take them away 1 at a time.

In this manner all the examples in this section may be solved.

B & C. The articles B and C contain the common addition table as far as the first 10 numbers. In the first the numbers are placed in order, and in the second, out of order.

The pupil should study these until he can find the answers readily, and then he should commit the answers to memory.

D. In this article the numbers are larger than in the preceding, and in some instances, three or more numbers are added together. In the abstract examples the numbers from one to ten are to be added to the numbers from ten to twenty.

E. This article contains subtraction.

F. This article is intended to make the pupil familiar with adding the nine first numbers to all others. The pupil should study it until he can answer the questions very readily.

G. In this article all the preceding are combined together, and the numbers from 1 to 10 are added to all numbers from 20 to 100; and subtracted in the same manner.

18. 57 and 6 are 63, and 3 are 66, and 5 are 71, and 2 are 73, less 8 are 65.

H. This article contains practical questions which show the application of all the preceding articles.

6. 37 less 5 are 32, less 8 are 24, less 6 (which he kept himself) are 18; consequently he gave 18 to the third boy.

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SECTION II.

THIS section contains multiplication. The pupil will see no difference between this and addition. It is best that he should not at first, though it may be well to explain it to him after a while.

A. This article contains practical questions, which the pupil will readily answer.

1. Three yards will cost 3 times as much as 1 yard.

N. B. Be careful to make the pupil give a similar reason for multiplication, both in this article, and elsewhere.

This question is solved on the plate thus; in the second row, count 3 rectangles, and find their sum. 2 and 2 are 4 and 2 are 6.

11. A man will travel 4 times as far in 4 hours as he will in 1 hour. In the third row count 4 times 3, and ascertain their sum.

15. There are 4 times as many feet in 4 yards as in 1 yard, or 4 times 3 feet.

B. This article contains the common multiplication table, as far as the product of the first ten numbers. The pupil should find the answers once or twice through, until he can find them readily, and then let him commit them to memory.

43. 6 times 3. In the third row count 6 times 3, and then ascertain their sum. 3 and 3 are 6, &c.

59. 7 times 9. In the ninth row count 7 times 9, or 7 rectangles, and ascertain their sum. 9 and 9 are 18, &c.

C. This article is the same as the preceding, except in this the numbers are out of their natural order.

D. In this article multiplication is applied to practical examples. They are of the same kind as those in article A of this section.

12. There are 8 times as many squares in 8 rows, as in 1 row. 8 times 8 are 64.

13. There are 6 times as many farthings in 6 pence, as in 1 penny. 6 times 4 are 24.

17. 12 times 4 are 48.

Note. When a number is taken more than 10 times, as in the above example, after taking it 10 times on the plate, begin at the beginning of the row again, and take enough to make up the number.

23. There are 3 times as many pints in 3 quarts as in 1 quart. 3 times 2 are 6. And in 6 pints there are 6 times 4 gills or 24 gills.

28. In 3 gallons there are 12 quarts, and in 12 quarts there are 24 pints.

31. In 2 gallons are 8 quarts, in 8 quarts 16 pints; in 16 pints 64 gills. 16 times 4 are 64.

35. In one gallon are 32 gills; and 32 times 2

cents are 64 cents. Or, 1 pint will cost 8 cents, and there are 8 pints in a gallon. 8 times 8 are 64.

38. They will be 2 miles apart in 1 hour, 4 miles in 2 hours, &c.

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SECTION III.

A. This section contains division. The pupil will scarcely distinguish it from multiplication. It is not important that he should at first.

Though the pupil will be able to answer these questions by the multiplication table, if he has committed it to memory thoroughly; yet it will be better to use the plate for some time.

9. As many times as 3 dollars are contained in 15 dollars, so many yards of cloth may be bought for 15 dollars. On plate I, in the third row, count fifteen and see how many times 3 it makes. It is performed very nearly like multiplication.

B. In this article the pupil obtains the first ideas of fractions, and learns the most important of the terms which are applied to fractions.* The pupil has already been accustomed to look upon a collection of units, as forming a number, or as being itself a part of another number. He knows, therefore, that one is a part of every number, and that every number is a part of every number larger than itself. As every number may have a variety of parts, it is necessary to give names to the different parts in order to distinguish them from each other. The parts receive their names, according to the number of parts which any number is divided into. If the number is divided into two equal parts, the parts are called halves, if it is divided into three equal parts, they are called thirds, if into four parts, fourths, &c.; and having divided a number into parts, we can take as many of the parts as we choose. If a number be divided into five equal parts, and three of the parts be taken, the fraction is called *three fifths* of the number. The *name* shows at once into how many parts the number is to be divided, and how many parts are taken.

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* As soon as the terms applied to fractions are fully comprehended the operations on them are as simple as those on whole numbers.

The examples in this book are so arranged that the *names* will usually show the pupil how the operation is to be performed. In this section, although the pupil is taught to divide numbers into various parts, he is not taught to notice any fractions, except those where the numbers are divided into their simple units, which is the most simple kind.

It will be best to use beans, pebbles, &c. first; and then plate I.

4. Show the pupil one of the rectangles in the second row, and explain to him that one is 1 half of 2.

7. In the second row count 3 units; it will take all the marks in the first, and 1 in the second rectangle. Consequently it is 1 time 2, and 1 half of another 2.

15. In the second row count 9. It will take all the marks in the four first rectangles, and 1 in the fifth. Therefore 9 is 4 times 2 and one half of another 2.

18. Show the pupil a rectangle in the third row, and ask him the question, and explain to him that 1 is 1 third of 3.

20. Since 1 is 1 third of 3, 2 must be 2 thirds of 3.

34. In the third row count 11. It will take 3

rectangles and 2 marks in the fourth. Therefore 11 is 3 times 3, and 2 thirds of another 3.

Proceed in the same manner with the other divisions.

This being one of the most useful combinations, and one but very little understood by most people, especially when applied to large numbers, the pupil must be made perfectly familiar with it. Ask questions like those in the book for large numbers, and also some like the following: What part of 7 is 18? the answer will be $\frac{18}{7}$.

C. The first ten figures are here explained. They are used as an abridged method of writing numbers, and not with any reference to their use in calculating.

This article is only a continuation of the last. All the numbers from 1 to 100 are introduced into the two articles, and are divided by all the numbers from 1 to 10; except that some of the largest are not divided by some of the smallest.

2. The pupil answers first, how many times 2 is contained in 12, then how many times 3.

45. 63 are how many times 5? In the fifth row count 63. It will take 12 rectangles and 3 marks in the 13th. It will be necessary to count once across the plate and begin again, and take 2 rectangles and a part of the third. 63 is 12 times 5 and 3 fifths of another 5.

D. These examples, which are similar to those in article A of this section, are solved in the same manner.

5. It would take as many hours, as 3 miles are contained in 10 miles. 3 hours and $\frac{1}{3}$ of an hour.

20. They cost as many cents as there are 3 apples in 30 apples; that is, 10 cents.

21. 12 dollars a month: and 12 dollars a month is 3 dollars a week; that is, 18 shillings a week, which is 3 shillings a day.

26. The whole loss was 35 dollars, which was 7 dollars apiece.

SECTION IV.

A. This article contains multiplication simply. It is repeating a number a certain number of times and a part of another time.

14. 6 times 5 are 30, and $\frac{3}{5}$ of 5 are 3, which added to 30 make 33. On the plate in the fifth row, take 6 rectangles and 3 marks in the seventh, and ascertain their sum.

B. In this article the pupil is taught to change a certain number of twos into threes, threes into fives, &c. This article combines all the preceding operations.

24. 4 cords of wood will cost 28 dollars, and $\frac{2}{7}$ of a cord will cost 2 dollars, which makes 30 dollars. 30 dollars will buy 3 hundred weight of sugar and $\frac{6}{8}$ of another hundred weight.

29. 7 times 8 are 56, and $\frac{5}{8}$ of 8 are 5, which added to 56 make 61; 61 are 6 times 9, and $\frac{7}{9}$ of 9.

C. 1. 4 bushels of apples, at 3 shillings a bushel, come to 12 shillings; and 12 shillings are 2 dollars.

2. The two lemons come to 8 cents, and 8 cents will buy 4 apples, at 2 cents apiece.

This is usually called Barter. The general principle is to find what the article will come to, whose price and quantity are given, and then to find how much of the other article that money will buy.

6. If 2 apples cost 4 cents, 1 will cost 2 cents, and 4 will cost 8 cents. Or 4 apples will cost 2 times as much as 2 apples.

22. Find how many times 2 pears are contained in 20 pears, which is 10 times. 10 times 3 cents are 30 cents. Or, first find what 20 pears would come to, at 3 cents apiece; and since it is 2 for 3 cents, instead of 1 for 3 cents, the price will be half as much.

23. See how many times you can have 5 cents in 30 cents, and you can buy so many times 3 eggs. 30 is 6 times 5, and 6 times 3 are 18. 18 eggs.

24. 10 dollars a week, and 40 dollars a month.

25. 5 dollars are 30 shillings, which is 10 shillings a day.

26. 5 dollars apiece.

SECTION V.

In this section the principle of fractions is applied to larger numbers, but such as are divisible into the parts proposed to be taken. The pupil, who is familiar with what precedes, will easily understand the examples in this section. They require nothing but division and multiplication.

A. Let the pupil explain each example in the following manner. What is 1 sixth of 18? *Ans.* 3. Why? Because 6 times 3 are 18; therefore if you divide 18 into 6 equal parts, one of the parts will be 3.

To find this answer on the plate; on the 6th row, the pupil will find 3 times 6 make 18; this will direct him to the third row, where he will find 6 times 3 are 18. Consequently, he will see 18 divided into 6 equal parts. It will be well to let the pupil prove a large number of the examples on the plate.

The pupil will be very likely to say 3 is the 6th part of 18, because 3 times 6 are 18. Be careful to make him say it the other way, viz. 6 times 3 are 18.

14. 1 third of 9 is 3; $\frac{2}{3}$ is 2 times as much as $\frac{1}{3}$, therefore $\frac{2}{3}$ of 9 is 6.

19. 1 barrel will cost $\frac{1}{4}$ part of 12 dollars; 3 barrels will cost $\frac{3}{4}$ of 12 dollars. 7 barrels will cost $\frac{7}{4}$ of 12 dollars.

37. What is $\frac{5}{8}$ of 32? $\frac{1}{8}$ of 32 is 4, $\frac{5}{8}$ are 5 times 4, or 20.

B. 11. $\frac{1}{5}$ of 20 is 4; $\frac{7}{5}$ are 7 times 4, or 28; and 28 is 4 times 6, and $\frac{4}{6}$ of 6.

C. 3. 1 half of 10 is 5, $\frac{2}{5}$ of 10 are 4; 5 and 4 are 9. He gave away 9 and had 1 left.

4. 1 yard will cost $\frac{1}{3}$ of what 3 yards cost. $\frac{1}{3}$ of 6 dollars is 2 dollars.

5. 2 yards will cost 1 half of what 4 cost; or 6 dollars.

6. 3 apples will cost $\frac{1}{3}$ of what 9 cost; or 6 cents.

7. 2 is $\frac{2}{3}$ of 3; therefore 2 oranges will cost $\frac{2}{3}$ of what 3 cost. $\frac{2}{3}$ of 18 cents are 12 cents.

8. $\frac{4}{5}$ of 25 are 20. The 10 apples cost 20 cents, which was 2 cents apiece.

11. $\frac{2}{7}$ of 42 are 12, and 6 times 12 are 72. 72 dollars.

13. 3 is $\frac{3}{4}$ of 4. $\frac{3}{4}$ of 12 dollars are 9 dollars. Or 4 yards at 12 dollars is 3 dollars a yard, and 9 dollars for 3 yards.

14. Solved like the 13th. *Ans.* 15 cents.

15. Since 1 is $\frac{1}{3}$ of 3, 7 is $\frac{7}{3}$ of 3. $\frac{7}{3}$ of 15 cents are 35 cents. Or, 3 oranges at 15 cents, is 5 cents apiece: 7 times 5 are 35 cents.

Note. In questions of this kind it is generally the simplest way to find what 1 article will cost, then it may easily be told how much any number will cost.

19. 4 men would do it in 1 half the time that 2 would do it. Or, you may say, if 2 men would do it in 6 days, 1 man would do it in 12 days, and 4 men in $\frac{1}{4}$ of that time, or 3 days.

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SECTION VI.

A. 4. 2 halves of any number make the whole number. Therefore 2 is 1 half of 2 times 2; or 4. It is $\frac{1}{4}$ of 4 times 2, or 8.

Let the pupil answer these questions in the following manner: 4 is $\frac{1}{3}$ of 3 times 4; 3 times 4 are 12. 5 is $\frac{1}{7}$ of 7 times 5; 7 times 5 are 35.

B. 2. 4 is 2 times 2.

4. 6 is 2 times 3.

16. 2 thirds of any number is twice as much as $\frac{1}{3}$ of the same number. If 4 is $\frac{2}{3}$ of some number, then 1 half of 4 or 2 is $\frac{1}{3}$ of that number; 2 is $\frac{1}{3}$ of 6: therefore 4 is $\frac{2}{3}$ of 6.

20. If 6 is $\frac{3}{4}$ of a number, $\frac{1}{3}$ of 6 or 2 is $\frac{1}{4}$ of the same number; 2 is $\frac{1}{4}$ of 8; therefore 6 is $\frac{3}{4}$ of 8.

23. It is evident that $\frac{1}{7}$ of a pound will cost only $\frac{1}{3}$ of what $\frac{3}{7}$ will cost. If $\frac{3}{7}$ cost 6 cents, $\frac{1}{7}$ will cost 2 cents, and the whole pound 14 cents.

26. It will probably be perceived by this time, that $\frac{2}{7}$ of a number being given, it is necessary to find $\frac{1}{7}$, and then the number is easily found; 4 being $\frac{2}{7}$, 2 is $\frac{1}{7}$, and 2 is $\frac{1}{7}$ of 14.

45. 24 being $\frac{8}{9}$, $\frac{1}{8}$ of 24 or 3 will be $\frac{1}{9}$; 3 is $\frac{1}{9}$ of 27.

C. 6. 20 being $\frac{4}{7}$, 5 is $\frac{1}{7}$, and 5 is $\frac{1}{7}$ of 35; and 35 is 5 times 6, and $\frac{5}{6}$ of 6.

D. 4. 18 is 3 times 6, and 6 is $\frac{1}{4}$ of 4 times 6, or 24. *Ans.* 24 dollars.

6. 54 is $\frac{9}{8}$ of 48; 12 yards at 48 dollars is 4 dollars a yard. He gained 6 dollars.

7. 10 feet is $\frac{2}{3}$ of 15 feet.

8. If $\frac{2}{3}$ are under water, there must be $\frac{1}{3}$ out of the water. 4 is $\frac{1}{3}$ of 12.

9. If $\frac{2}{5}$ are under water there must be $\frac{3}{5}$ out of the water. 6 is $\frac{3}{5}$ of 10.

10. $\frac{3}{7}$ and $\frac{2}{7}$ are $\frac{5}{7}$. $\frac{5}{7}$ bear cherries and peaches; consequently, the 10 which bear plums must be the other $\frac{2}{7}$; 10 is $\frac{2}{7}$ of 35. 10 bear peaches and 15 bear cherries.

11. $\frac{2}{9}$, and $\frac{3}{9}$, and $\frac{1}{9}$, and $\frac{1}{9}$, are $\frac{7}{9}$; therefore 12 must be the other $\frac{2}{9}$ of the whole. The whole number is 54.

Miscellaneous Examples.

6. The grey-hound gains upon the fox 4 rods in a minute. It will take him 20 minutes to gain 80 rods.

8. $\frac{3}{8}$ of 24. Or you may say, 1 sheep would cost 3 dollars, and 3 sheep 9 dollars.

9. 30 horses will eat 10 times as much as 3 horses.

11. 10 dollars apiece, and 2 dollars a yard.

12. 5 dollars for 1 week, 20 dollars for a month, and 25 dollars for 5 weeks.

14. It would take them 5 times as long to eat 40 bushels, as it would to eat 8 bushels.

15. 4 horses would eat 4 bushels in 3 days, and it would take them 9 times as long to eat 36 bushels. *Ans.* 27 days.

16. If 2 men spend 12 dollars in 1 week, 1 man will spend 6 dollars in 1 week, and 30 dollars in 5 weeks, and 3 men would spend 3 times as much, or 90 dollars.

17. The shadow of the staff is $\frac{2}{3}$ of the length of the staff, therefore the shadow of the pole must be $\frac{2}{3}$ the length of the pole. 18 feet is $\frac{2}{3}$ of 27 feet.

20. It would take 2 men 3 times as long to do it as it would 6 men.

23. 8 men would do a piece of work 1 half as large in 2 days, and it would take 2 men 4 times as long to do it, or 8 days.

28. He must sell it for 56 dollars in order to gain 16 dollars. 56 dollars is 7 dollars per barrel.

29. It cost him 35 dollars, and he must sell it for 45 to gain 10 dollars; 45 dollars is 9 dollars a firkin.

30. *Ans.* 56 cents, see section VI.

33. If it would last 3 men 10 months, it would last 1 man 30 months, and 5 men 6 months.

34. There are 8 times 5 in 40, and since the other would build as many times 9, as the first does 5, he would build 8 times 9 or 72 rods.

SECTION VII.

A. 13. $\frac{1}{5}$ of 20 is 4, $\frac{4}{5}$ are 16; 16 being $\frac{8}{7}$, 2 is $\frac{1}{7}$; 2 is $\frac{1}{7}$ of 14, and 16 is $\frac{8}{7}$ of 14.

16. $\frac{3}{7}$ of 28 are 12; 12 is 2 times 6, and 6 is $\frac{1}{8}$ of 48, (12 is $\frac{2}{8}$ of 48) and 48 is 6 times 7 and $\frac{6}{7}$ of 7.

B. 1. $\frac{4}{5}$ of 15 are 12; 12 is 6 times 2; 2 is $\frac{1}{10}$ of 20 (12 is $\frac{6}{10}$ of 20); $\frac{1}{3}$ of 21 is 7; 20 is 2 times 7 and $\frac{6}{7}$ of 7.

2. $\frac{4}{3}$ of 18 are 24; 24 is $\frac{8}{9}$ of 27; $\frac{1}{7}$ of 35 is 5; 27 is 5 times 5 and $\frac{2}{5}$ of 5.

C. This article contains the multiplication table, in which the numbers from 10 to 20 are multiplied by the ten first numbers.

SECTION VIII.

Explanation of Plate II.

Plate I, which has been used in the preceding sections, presents each unit as a simple object and undivided. Plate II, presents the units as divisible objects, the different fractions of which form parts, and sums of parts of unity.

This plate is divided into ten rows of equal squares, and each row into ten squares.

The first row is composed of ten empty squares, which are to be represented to the pupil as entire units. The second row presents ten squares, each divided into two equal parts by a vertical line, each of these parts of course represents *one half*. In the third row, each square is divided into three equal parts, by two vertical lines, each part representing *one third, &c.* to the tenth row, which is divided into ten equal parts, each part representing *one tenth* of unity.

N. B. In plates II and III, the spaces and not the marks are to be counted.

Be careful to make the pupil understand, 1st, that each *square* on the plate is to be considered as an entire unit, or whole one. 2d, explain the divisions into two, three, four, &c. parts. 3d, teach him to name the different parts. Make him observe that the name shows into how many parts one is divided, and how many parts are taken, in the same manner as it does when applied to larger numbers. $\frac{4}{7}$ for example, shows that one thing is to be divided into 7 equal parts, and 4 of those parts are to be taken. 4th, make the pupil compare the different parts together, and observe which is the largest. Ask him such questions as the following: Which are the smallest halves or thirds? *Ans.* Thirds. Why? Because, the more parts a thing is divided into, the smaller the parts must be.

A. 15. On plate II., count two squares in the second row, and then ascertain the number of spaces or halves in them. There are 4 halves.

21. In the 2d row take 3 squares and 1 space in the 4th square; then count the spaces. *Ans.* 7 halves.

37. In the 3d row take 5 squares, and 2 spaces in the 6th; then count the spaces or thirds. *Ans.* 17 thirds.

54. In the 5th row take 6 squares, and 4 spaces in the 7th square; then count the spaces or fifths. *Ans.* 34 fifths.

B. 2. This operation is the reverse of the last. In the 2d row count 4 spaces or halves, and see how many squares or whole ones it takes. It will take 2.

38. In the 9th row count 48 spaces or 9ths, and see how many squares or whole ones it takes. It will take 5 squares and 3 spaces in the 6th. *Ans.* 5 whole ones and $\frac{3}{9}$.

SECTION IX.

A. 2. $\frac{1}{3}$ signifies that 1 thing is divided into 3 equal parts, and 1 part taken. Therefore 2 times 1 third is 2 parts, or $\frac{2}{3}$.

6. 7 times $\frac{1}{3}$ is $\frac{7}{3}$, or $2\frac{1}{3}$.

10. On the plate in the 3d row, 5 times $\frac{2}{3}$ are $\frac{10}{3}$, which takes 3 squares and 1 space. *Ans.* $3\frac{1}{3}$.

24. In the 9th row take 4 spaces or 9ths, and repeat them 5 times, which will make $\frac{20}{9}$, and will take 2 squares and 2 spaces. *Ans.* $2\frac{2}{9}$.

B. 4. 4 times 2 are 8, and 4 times 1 half are 4 halves, or 2, which added to 8 make 10.

18. 4 times 3 are 12, and 4 times $\frac{3}{4}$ are $\frac{12}{4}$, or three whole ones, which added to 12 make 15.

32. 2 times 3 are 6, and 2 times $\frac{3}{7}$ are $\frac{6}{7}$, which added to 6 make $6\frac{6}{7}$.

40. 10 barrels of cider at 3 dollars and $\frac{5}{6}$ a barrel; 10 barrels at 3 dollars, would be 30 dollars, then 10 times $\frac{5}{6}$ is $\frac{50}{6}$, or 8 and $\frac{2}{6}$ of a dollar. *Ans.* $38\frac{2}{6}$ dollars.

C. 2. $\frac{3}{4}$ to each would be 3 times $\frac{3}{4}$, or $\frac{9}{4}$, which are $2\frac{1}{4}$ oranges.

3. $\frac{10}{5}$ or 2 bushels.

4. 7 times $\frac{3}{4}$ are $\frac{21}{4}$, or $5\frac{1}{4}$ gallons.

5. 8 yards and $\frac{8}{4}$ or 2 yards, that is, 10 yards.

6. 4 times 2 are 8, and 4 times $\frac{3}{5}$ are $\frac{12}{5}$, or $2\frac{2}{5}$, which added to 8 make $10\frac{2}{5}$ bushels.

12. It would take 1 man 3 times as long as it would 3 men. *Ans.* $13\frac{1}{3}$ days.

14. 3 men would build 3 times as much as 1 man; and in 4 days they would build 4 times as much as in 1 day. *Ans.* $38\frac{2}{3}$ rods.

15. *Ans.* 12 yards.

SECTION X.

A. 21. $\frac{1}{3}$ of 1 is $\frac{1}{3}$. $\frac{1}{3}$ of 2 is 2 times as much, or $\frac{2}{3}$. $\frac{1}{3}$ of 4 is $\frac{4}{3}$, or $1\frac{1}{3}$. $\frac{1}{3}$ of 5 is $\frac{5}{3}$, or $1\frac{2}{3}$. $\frac{1}{3}$ of 6 is $\frac{6}{3}$, or 2. $\frac{1}{3}$ of 7 is $\frac{7}{3}$, or $2\frac{1}{3}$.

27. $\frac{1}{5}$ of 1 is $\frac{1}{5}$. $\frac{1}{5}$ of 2 is $\frac{2}{5}$. $\frac{1}{5}$ of 3 is $\frac{3}{5}$. $\frac{1}{5}$ of 7 is $\frac{7}{5}$, or $1\frac{2}{5}$.

This manner of reasoning may be applied to any number. To find $\frac{1}{7}$ of 38: it is $\frac{38}{7}$, for $\frac{1}{7}$ of 38 is 38 times as much as $\frac{1}{7}$ of 1, and $\frac{1}{7}$ of 1 is $\frac{1}{7}$, consequently $\frac{1}{7}$ of 38 is $\frac{38}{7}$, and $\frac{38}{7}$ is $5\frac{3}{7}$.

40. To find $\frac{2}{3}$ of a number, $\frac{1}{3}$ must be found first, and then $\frac{2}{3}$ will be 2 times as much. $\frac{1}{3}$ of 7 is $\frac{7}{3}$, and 2 times $\frac{7}{3}$ are $\frac{14}{3}$, or $4\frac{2}{3}$.

74. $\frac{1}{9}$ of 50 is $\frac{50}{9}$, or $5\frac{5}{9}$; $\frac{4}{9}$ is 4 times as much; 4 times 5 are 20, 4 times $\frac{5}{9}$ are $\frac{20}{9}$, or $2\frac{2}{9}$, which added to 20 make $22\frac{2}{9}$.

NOTE. The manner employed in example 40th is best for small numbers, and that in the 74th for large numbers.

B. 2. *Ans.* $1\frac{2}{3}$ apiece.

3. $\frac{1}{5}$ of 3 is $\frac{3}{5}$; $\frac{3}{5}$ of a bushel apiece.

4. $\frac{3}{5}$ of 7 is $4\frac{1}{5}$; he gave away $4\frac{1}{5}$ and kept $2\frac{4}{5}$

6. 1 half dollar a yard, or 50 cents.

7. $\frac{1}{5}$ of 7 is $\frac{7}{5}$, or $1\frac{2}{5}$; $\frac{2}{5}$ of a dollar is $\frac{2}{5}$ of 100 cents, which is 40 cents. *Ans.* 1 dollar and 40 cents a bushel.

8. $\frac{1}{6}$ of 8 is $1\frac{2}{6}$. $\frac{2}{6}$ of 100 is $33\frac{2}{6}$. *Ans.* 1 dollar and $33\frac{2}{6}$ cents, or it is 1 dollar and 2 shillings.

9. If 3 bushels cost 8 dollars, 1 bushel will cost 2 dollars and $\frac{2}{3}$, and 2 bushels will cost $5\frac{1}{3}$ dollars. *Ans.* 5 dollars and 2 shillings, or $33\frac{2}{6}$ cents.

13. If 7 pounds cost 40 cents, 1 will cost $5\frac{5}{7}$ cents; 10 pounds will cost $57\frac{1}{7}$ cents.

16. 1 cock would empty it in 6 hours, and 7 cocks

would empty it in $\frac{1}{7}$ of 6 hours, or $\frac{6}{7}$ of 1 hour, which is $\frac{6}{7}$ of 60 minutes; $\frac{6}{7}$ of 60 minutes; is $51\frac{3}{7}$ minutes.

SECTION XI.

A. 2. 2 halves of a number make the number; consequently 1 and 1 half is the half of 2 times 1 and 1 half, which is 3.

15. $4\frac{3}{7}$ is $\frac{1}{5}$ of 5 times 4 and $\frac{3}{7}$, which is $22\frac{1}{7}$.

[illegible] $4\frac{3}{7}$ is $\frac{1}{9}$ of 9 times $4\frac{3}{7}$, which is $39\frac{6}{7}$.

B. 4. 5 is 3 times $\frac{1}{3}$ of 5, which is $\frac{5}{3}$, or $1\frac{2}{3}$.

30. If 8 is $\frac{3}{4}$ of some number, $\frac{1}{3}$ of 8 is $\frac{1}{4}$ of the same number. $\frac{1}{3}$ of 8 is $2\frac{2}{3}$, $2\frac{2}{3}$ is $\frac{1}{4}$ of 4 times $2\frac{2}{3}$, which is $10\frac{2}{3}$; therefore 8 is $\frac{3}{4}$ of $10\frac{2}{3}$.

40. If 8 is $\frac{6}{7}$, $\frac{1}{6}$ of 8 is $\frac{1}{7}$; $\frac{1}{6}$ of 8 is $\frac{8}{6}$, $\frac{8}{6}$ is $\frac{1}{7}$ of $\frac{56}{6}$, or $9\frac{2}{6}$; therefore 8 is $\frac{6}{7}$ of $9\frac{2}{6}$.

52. If $\frac{5}{9}$ of a ton cost 23 dollars, $\frac{1}{9}$ of a ton must be $\frac{1}{5}$ of 23, that is $4\frac{3}{5}$ dollars, and the whole would cost 9 times as much, that is, $41\frac{2}{5}$.

69. $\frac{1}{9}$ of 65 is $7\frac{2}{9}$; $7\frac{2}{9}$ is $\frac{1}{5}$ of 5 times $7\frac{2}{9}$, which is $36\frac{1}{9}$. 65 is $\frac{9}{5}$ of $36\frac{1}{9}$.

C. 4. 37 is $\frac{9}{8}$ of $32\frac{8}{9}$, which taken from 37 leaves $4\frac{1}{9}$. *Ans.* $4\frac{1}{9}$ dollars.

5. 7 feet must be $\frac{2}{5}$ of the whole pole.

6. If he lost $\frac{2}{9}$, he must have sold it for $\frac{7}{9}$ of what it cost. 47 is $\frac{7}{9}$ of $60\frac{3}{7}$. *Ans.* 60 dollars and $42\frac{6}{7}$ cents.

Miscellaneous Examples.

1. The shadow of the staff is $\frac{4}{5}$ of the length of the staff; therefore the shadow of the pole is $\frac{4}{5}$ of the length of the pole. 67 is $\frac{4}{5}$ of $83\frac{3}{4}$. *Ans.* $83\frac{3}{4}$ feet.

2. 9 gallons remain in the cistern in 1 hour. It will be filled in 10 hours and $\frac{1}{9}$; $\frac{1}{9}$ of 60 minutes

are 46 minutes and $\frac{6}{9}$; $\frac{6}{9}$ of 60 seconds are 40 seconds. *Ans.* 10 hours, 46 minutes, 40 seconds.

10. Find $\frac{2}{5}$ of 33, and subtract it from 17. *Ans.* $3\frac{4}{5}$.

11. It will take 3 times 10 yards.

13. 5 is $\frac{5}{3}$ of 3; it will take $\frac{5}{3}$ as much. Or 7 yards, 5 quarters wide, are equal to 35 yards 1 quarter wide, which is equal to $11\frac{2}{3}$ yards that is 3 quarters wide.

15. $\frac{3}{5}$ of 37 dollars.

16. $\frac{5}{4}$ as much.

SECTION XII.

The examples in this section are performed in precisely the same manner, as those in the sections to which they refer. All the difficulty consists in comprehending, that fractions expressed in figures signify the same thing as when expressed in words. Make the pupil express them in words, and all the difficulty will vanish. Let particular attention be paid to the explanation of fractions given in the section.

VIII. A. 6. In 7 how many $\frac{1}{6}$? expressed in words, is, in 7 how many sixths? *Ans.* $\frac{42}{6}$.

14. Reduce $8\frac{3}{10}$ to an improper fraction; that is, in 8 and 3 tenths, how many tenths? *Ans.* $\frac{83}{10}$.

B. 8. $\frac{23}{7}$ are how many times 1? That is, in 23 sevenths how many whole ones? *Ans.* $3\frac{2}{7}$.

IX. B. 3. How much is 5 times $6\frac{4}{7}$? That is, how much is 5 times 6 and 4 sevenths? *Ans.* $32\frac{6}{7}$.

V. & X. 15. What is $\frac{5}{8}$ of 27? That is, what is 5 eighths of 27? *Ans.* $16\frac{7}{8}$.

VI. & XI. A. 8. $7\frac{6}{7}$ is $\frac{1}{8}$ of what number? That is, 7 and 6 sevenths is 1 eighth of what number? *Ans.* $62\frac{6}{7}$.

B. 4. 12 is $\frac{3}{7}$ of what number? That is, 12 is 3 sevenths of what number? *Ans.* 28.

12. 4 is $\frac{3}{5}$ of what number? That is, 4 is 3 fifths of what number? *Ans.* $6\frac{2}{3}$.

Explanation of Plate III.

Plate III is intended to represent fractions of unity, divided into other fractions; it is, therefore, an extension of plate II. It differs from it, only in this, that besides the vertical divisions, the squares are divided horizontally, so as to cut the fractions of the square into fractions of fractions. The horizontal lines are dotted, but they are to be considered as lines.

This plate, like the preceding, is divided into ten rows of squares, each row containing ten equal squares. In the first row, the first square is undivided, the 9 following squares are divided by horizontal lines into from two to ten equal parts. In all the other squares the vertical divisions are the same as in Plate II, and besides this, each row is divided horizontally in the same manner as the first row.

By means of this double division, the 2d row presents a series of fractions, from halves to twentieths. The 3d row presents a series from thirds to thirtieths, and so on to the 10th row, which presents a series from tenths to hundredths.

The 2d row, besides presenting halves, fourths, sixths, eighths, &c. shows also halves of halves, thirds of halves, fourths of halves, &c. and shows their ratios with unity.

The 3d row, besides thirds, sixths, ninths, &c. shows halves of thirds, thirds of thirds, &c. and their ratios with unity. The other rows present analagous divisions.

SECTION XIII.

The operations in this section are the reducing of fractions to a common denominator, and the addition and subtraction of fractions. The examples will generally show what is to be done, and how it is to be done. Plate III will be found very useful in explaining the operations, by exhibiting the divisions to the eye.

1. The first example may be illustrated by the second square in the second row. This square is divided into halves by a vertical line, and then into fourths by the horizontal line. It will be readily seen that $\frac{1}{2}$ makes 2 fourths, and that the first had twice as much as the second. The plate will not be so necessary for the practical questions as for the abstract. In the second example therefore it will be more useful than in the first.

4. It will readily be seen on the second square of the second row, that $\frac{1}{2}$ and $\frac{1}{4}$ are $\frac{3}{4}$.

8. It will be seen in the third square of the second row, that $\frac{1}{2}$ makes $\frac{3}{6}$.

10 and 12. In the second square of the third row, it will be found, that $\frac{1}{3}$ makes $\frac{2}{6}$; and that $\frac{}{3}$ make $\frac{4}{6}$.

25. In the fourth square of the second row, it will be seen that 1 half is $\frac{4}{8}$; and in the second square of the fourth row, $\frac{1}{4}$ is $\frac{2}{8}$, both together make $\frac{6}{8}$ and $\frac{1}{8}$ make $\frac{7}{8}$.

27. In the second square of the fourth row, $\frac{3}{4}$ is the same as $\frac{6}{8}$.

33. In the fifth square of the fourth row, it will be seen that $\frac{1}{4}$ (made by the vertical division) contains $\frac{5}{20}$; and in the fourth square of the fifth row $\frac{1}{5}$ contains $\frac{4}{20}$, and $\frac{2}{5}$ contain $\frac{8}{20}$; and in the second square of the tenth row $\frac{1}{10}$ contains $\frac{2}{20}$.

When these questions are performed in the mind, the pupil will explain them as follows. He will probably do it without assistance. Twenty twentieths make one whole one. $\frac{1}{4}$ of 20 is 5, and $\frac{2}{5}$ of 20 is 8, and $\frac{1}{10}$ of 20 is 2; therefore $\frac{1}{4}$ is $\frac{4}{20}$, $\frac{2}{5}$ is $\frac{8}{20}$ and $\frac{1}{10}$ is $\frac{2}{20}$. All the examples should be explained in the same manner.

45. In the 8th row, the 7th square is divided vertically into 8 parts, and horizontally into 7 parts, the square, therefore, is divided into 56 parts; 3 of the vertical divisions, or $\frac{3}{8}$ contain $\frac{21}{56}$.

51. 1 half is $\frac{4}{8}$, and $\frac{1}{4}$ is $\frac{2}{8}$, which added together make $\frac{6}{8}$.

61. $\frac{2}{5}$ is $\frac{8}{20}$, $\frac{3}{10}$ is $\frac{6}{20}$, $\frac{1}{4}$ is $\frac{5}{20}$, which added together make $\frac{19}{20}$.

67. $\frac{2}{3}$ is $\frac{8}{12}$, $\frac{3}{4}$ is $\frac{9}{12}$, which added together make $\frac{17}{12}$; from $\frac{17}{12}$ take $\frac{5}{12}$, and there remains $\frac{12}{12}$, or 1.

82. It will be easily perceived that these examples do not differ from those in the first part of the section, except in the language used. They must be reduced to a common denominator, and then they may be added and subtracted as easily as whole numbers. $\frac{2}{3}$ is $\frac{10}{15}$, and $\frac{2}{5}$ is $\frac{6}{15}$, and both together make $\frac{16}{15}$ or $1\frac{1}{5}$.

86. $\frac{1}{3}$ is $\frac{2}{6}$, and $\frac{1}{2}$ is $\frac{3}{6}$. If $\frac{2}{6}$ be taken from $\frac{3}{6}$ there remains $\frac{1}{6}$.

B. This article contains only a practical application of the preceding.

3. This example and some of the following contain mixed numbers, but they are quite as easy as the others. The whole numbers may be added separately, and the fractions reduced to a common denominator, and then added as in other cases, and afterwards joined to the whole numbers. 6 and 2 are 8; 1 half and $\frac{1}{3}$ are $\frac{5}{6}$, making in the whole $8\frac{5}{6}$ bushels.

5. 6 and 2 are 8; $\frac{3}{5}$ and $\frac{1}{2}$ and $\frac{3}{4}$ are $\frac{37}{20}$ or $1\frac{17}{20}$, which joined with 8 make $9\frac{17}{20}$.

C. It is difficult to find examples which will aptly illustrate this operation. It can be done more conveniently by the instructer. Whenever a fraction occurs, which may be reduced to lower terms, if it be suggested to the pupil, he will readily perceive it and do it. This may be done in almost any part of the book, but more especially after studying the 13th section. Perhaps it would be as well to omit this article the first time the pupil goes through the book, and after he has seen the use of the operation, to let him study it. It may be illustrated on Plate III in the following manner.

8. $\frac{18}{24}$. Find all the squares which are divided into 24 parts. There are 4 squares which are divided into 24 parts, viz. the 8th in the 3d row, the 3d in the 8th row, the 6th in the 4th row, and the 4th in the 6th row. Then see if exactly 18 can be found in one or more of the vertical divisions. In the 6th square of the 4th row, there are exactly 18 divisions in three vertical divisions, but those 3 vertical divisions are $\frac{3}{4}$ of the whole square, because it is divided into fourths vertically; therefore $\frac{18}{24}$ are equal to $\frac{3}{4}$.

13. $\frac{42}{56}$. Find the squares which are divided into 56 parts; they are the 8th in the seventh row, and the 7th in the 8th row; see if in either of them, one or more of the vertical divisions contain exactly 42 parts. In the 7th of the 8th row, 6 vertical divisions contain exactly 42; these divisions are $\frac{6}{8}$ of the square, for it is divided vertically into 8 parts. But $\frac{6}{8}$ may be still reduced to $\frac{3}{4}$, as may be seen by looking on the 3d square of the 4th row; therefore $\frac{42}{56}$ is equal to $\frac{3}{4}$.

SECTION XIV.

A. This section contains the division of fractions by whole numbers, and the multiplication of one fraction by another. Though these operations sometimes appear to be division, and sometimes multiplication, yet there is actually no difference in the operations.

The practical examples will generally show how the operations are to be performed, but it will be well to use the plate for young pupils.

1 and 2. In the second row, the 2d square is divided vertically into halves, and each of the halves is divided into halves by the horizontal line; $\frac{1}{2}$ of $\frac{1}{2}$ is therefore $\frac{1}{4}$ of the whole.

3 and 4. In the third row, the 2d square shows that $\frac{1}{2}$ of $\frac{1}{3}$ is $\frac{1}{6}$.

16 and 17. In the 5th row, the 3d square shows that $\frac{1}{3}$ of $\frac{1}{5}$ is $\frac{1}{15}$ of the whole.

33. Since $\frac{3}{4}$ of a share signify 3 parts of a share, it is evident that $\frac{1}{3}$ of the three parts is 1 part, that is $\frac{1}{4}$.

39. $\frac{9}{7}$ signify 9 pieces or parts, and it is evident that $\frac{1}{3}$ of 9 parts is 3 parts, that is $\frac{3}{7}$.

43. We cannot take $\frac{1}{3}$ of 5 pieces, therefore we must take $\frac{1}{3}$ of $\frac{1}{6}$, which is $\frac{1}{18}$, and $\frac{5}{6}$ is 5 times as much as $\frac{1}{6}$, therefore $\frac{1}{3}$ of $\frac{5}{6}$ is $\frac{5}{18}$. This may be readily seen on the plate. In the sixth row, third square, find $\frac{5}{6}$ by the vertical division, then these being divided each into three parts by the horizontal division, and $\frac{1}{3}$ of each being taken, you will have $\frac{5}{18}$.

52. In the 4th row, the 3d square shows that $\frac{1}{3}$ of $\frac{1}{4}$ is $\frac{1}{12}$, and $\frac{2}{3}$ must be twice as much, or $\frac{2}{12}$.

56. In the fifth row, the 3d square shows that $\frac{1}{3}$ of $\frac{2}{5}$ is $\frac{2}{15}$, but $\frac{2}{3}$ must be twice as much as $\frac{1}{3}$, therefore $\frac{2}{3}$ of $\frac{2}{5}$, are $\frac{4}{15}$.

78. $8\frac{2}{5}$ is $\frac{42}{5}$, $\frac{1}{6}$ of $\frac{42}{5}$ is $\frac{7}{5}$.

79. $8\frac{4}{7}$ is $\frac{60}{7}$, $\frac{1}{7}$ of $\frac{1}{7}$ is $\frac{1}{49}$, consequently $\frac{1}{7}$ of $\frac{60}{7}$ is $\frac{60}{49}$, or $1\frac{11}{49}$.

86. We may say $\frac{1}{3}$ of $8\frac{4}{9}$ is 2, and $2\frac{4}{9}$ over, then $2\frac{4}{9}$ is $\frac{22}{9}$, and $\frac{1}{3}$ of $\frac{22}{9}$ is $\frac{22}{27}$, hence $\frac{1}{3}$ of $8\frac{4}{9}$ is $2\frac{22}{27}$.

90. $\frac{1}{7}$ of $18\frac{3}{5}$ is $2\frac{23}{35}$, and $\frac{3}{7}$ is 3 times as much, or $7\frac{34}{35}$.

B. 4. It would take 1 man 4 times $9\frac{3}{7}$, or $37\frac{5}{7}$ days, and 7 men would do it in $\frac{1}{7}$ of that time, that is in $5\frac{19}{45}$ days.

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SECTION XV.

A. This section contains the divisions of whole numbers by fractions, and fractions by fractions.

1. Since there are $\frac{6}{3}$ in 2, it is evident that he could give them to 6 boys if he gave them $\frac{1}{3}$ apiece, but if he gave them $\frac{2}{3}$ apiece, he could give them to only one half as many, or 3 boys.

5. If $\frac{1}{5}$ of a barrel would last them one month, it is evident that 4 barrels would last 20 months, but since it takes $\frac{2}{5}$ of a barrel, it will last them but one half as long, or 10 months.

7. $6\frac{3}{4}$ is $\frac{27}{4}$. If $\frac{1}{4}$ of a bushel would last a week, $6\frac{3}{4}$ bushels would last 27 weeks; but since it takes $\frac{3}{4}$, it will last only $\frac{1}{3}$ of the time, or 9 weeks.

13. If he had given $\frac{1}{2}$ of a bushel apiece, he might have given it to 17 persons, but since he gave 3 halves apiece, he could give it to only $\frac{1}{3}$ of that number, that is to 5 persons, and he would have 1 bushel left, which would be $\frac{2}{3}$ of enough for another.

23. $9\frac{3}{7}$ is $\frac{66}{7}$, and $1\frac{4}{7}$ is $\frac{11}{7}$. If it had been only $\frac{1}{7}$ of a dollar a barrel, he might have bought 66 barrels for $9\frac{3}{7}$ dollars, but since it was $\frac{11}{7}$ a bar-

rel, he could buy only $\frac{1}{11}$ of that number, that is, 6 barrels.

25 and 26. *Ans.* $9\frac{4}{7}$.

31. $4\frac{1}{5}$ is $\frac{21}{5}$, and $9\frac{3}{5}$ is $\frac{48}{5}$. Now $\frac{1}{5}$ is contained in $\frac{48}{5}$ 48 times, and $\frac{21}{5}$ is contained only $\frac{1}{21}$ part as many times, consequently only $2\frac{6}{21}$ or $2\frac{2}{7}$.

B. 1. $\frac{1}{2}$ is $\frac{5}{10}$; consequently 5 pounds can be bought for $\frac{1}{2}$ of a dollar.

3. $\frac{3}{4}$ is $\frac{9}{12}$, and $\frac{1}{6}$ is $\frac{2}{12}$. If he had given only $\frac{1}{12}$ apiece, he could have given it to 9 persons, but since he gave $\frac{2}{12}$ he could give it to only 1 half as many, or $4\frac{1}{2}$ persons.

5. $\frac{1}{7}$ is $\frac{3}{21}$, and $\frac{2}{3}$ is $\frac{14}{21}$. If a pound had cost $\frac{1}{21}$ of a dollar, 14 pounds could be bought for $\frac{14}{21}$ of a dollar, but since it costs $\frac{3}{21}$, only $\frac{1}{3}$ as many can be bought; that is, $4\frac{2}{3}$ pounds.

9. $\frac{2}{5}$ is $\frac{16}{40}$, and $1\frac{5}{8}$ is $\frac{65}{40}$. If a bushel had cost $\frac{1}{40}$ of a dollar, 65 bushels might have been bought, but since it cost $\frac{16}{40}$, only $\frac{1}{16}$ part as much could be bought; that is, $4\frac{1}{16}$ bushels.

12. $\frac{2}{9}$ is $\frac{4}{18}$, and $\frac{5}{6}$ is $\frac{15}{18}$, $\frac{1}{18}$ is contained in $\frac{15}{18}$ 15 times, but $\frac{4}{18}$ is contained only $\frac{1}{4}$ as many times; that is, $3\frac{3}{4}$ times.

Miscellaneous Example.

5. $\frac{3}{5}$ of a penny is $\frac{3}{5}$ of 4 farthings. *Ans.* $2\frac{2}{5}$ farthings.

6. $\frac{5}{6}$ of 12 pence. *Ans.* 10 pence.

7. $\frac{3}{5}$ of 4 quarters is 2 quarters and $\frac{2}{5}$ of a quarter; $\frac{2}{5}$ of a quarter is $\frac{2}{5}$ of 4 nails, which is $1\frac{3}{5}$ nails. *Ans.* 2 quarters, $1\frac{3}{5}$ nails.

13. $\frac{5}{8}$ of 24 hours is 15 hours.

14. $\frac{3}{5}$ of 24 hours is 14 hours and $\frac{2}{5}$ of an hour; $\frac{2}{5}$ of 60 minutes is 24 minutes. *Ans.* 14 hours, 24 minutes.

28. There being 4 farthings in a penny, 1 farthing is $\frac{1}{4}$ part of a penny.

30. 3 farthings is $\frac{3}{4}$ of a penny.

31. 1 penny is $\frac{1}{12}$ of a shilling, because there are 12 pence in a shilling.

34. 5 pence is $\frac{5}{12}$ of a shilling.

41. 1 shilling is $\frac{1}{20}$ of a pound.

43. 3 shillings is $\frac{3}{20}$ of a pound.

48. 1 farthing is $\frac{1}{48}$ of one shilling.

49. 2 farthings is $\frac{2}{48}$, or $\frac{1}{24}$ of a shilling. 5 farthings is $\frac{5}{48}$ of a shilling.

51. 1 penny is $\frac{1}{240}$ of 1 pound. 7 pence is $\frac{7}{240}$ of 1£.

59. 3s. 5d. is 41 pence, which is $\frac{41}{240}$ of 1£.

75. 1 nail is $\frac{1}{16}$ of a yard, 5 nails is $\frac{5}{16}$ of a yard.

89. 1 oz. is $\frac{1}{16}$ of 1 lb. 15 oz. is $\frac{15}{16}$ of 1 lb.

91. 1 lb. is $\frac{1}{28}$ of 1 quarter. 9 lbs. is $\frac{9}{28}$ of 1 quarter.

100. At the end of 1 hour they would be 7 and $\frac{4}{5}$ miles apart. In 7 hours, 7 times $7\frac{4}{5}$, which is $54\frac{3}{5}$ miles.

121. This is the principle of fellowship; 3 shillings were paid; one paid $\frac{1}{3}$, the other $\frac{2}{3}$.

122. One paid $\frac{3}{8}$, the other $\frac{5}{8}$.

123. 20 dollars were paid in the whole, one paid $\frac{6}{20}$, another $\frac{5}{20}$, and the third $\frac{9}{20}$.

126. 3 and 4 and 5, are 12. The first put in $\frac{3}{12}$; the second $\frac{4}{12}$; the third $\frac{5}{12}$.

129. 4 dollars for 2 months, is the same as 8 dollars for 1 month; 3 dollars for 3 months, is the same as 9 dollars for 1 month; and 2 dollars for 4 months, is the same as 8 dollars for 1 month. The question is the same as if A had put in 8 dollars, B 9 dollars, and C 8 dollars. A must have $\frac{8}{25}$, B $\frac{9}{25}$, and C $\frac{8}{25}$, of 100 dollars.

131. A's money was in 4 times as long as C's. It is the same as if A had put in 8 dollars for the

same time, and B 8 dollars for the same time. A must have $\frac{8}{22}$, B $\frac{8}{22}$, and C $\frac{6}{22}$, of 88 dollars.

The examples 127, 128, 129, 130, and 131, are double or compound fellowship.

139. The interest of 50 dollars for 1 year and 6 months is 4 dollars and 50 cents, and for 1 month it is 25 cents. The interest of 7 dollars for 18 months (a dollar is $\frac{1}{2}$ of a cent a month) is 63 cents. The whole amounts to 5 dollars and 38 cents.

140. The interest of 200 dollars for 1$\frac{1}{3}$ years is 16 dollars. The interest of 67 dollars is 67 cents for every 2 months, for 16 months it will be 8 times 67 cents, which are 5 dollars and 36 cents. The whole interest is 21 dollars and 36 cents.

143. The interest of 100 dollars for 2$\frac{1}{4}$ years, is 13 dollars and 50 cents. The interest of 100 dollars for 60 days would be 1 dollar, the interest for 20 days will be $\frac{1}{3}$ of a dollar, or 33$\frac{1}{3}$ cents. The interest of 1 dollar for 2$\frac{1}{4}$ years is 13$\frac{1}{2}$ cents, for 10 dollars the interest would be 1 dollar and 35 cents, and for 30 dollars, 4 dollars and 5 cents. The interest of 7 dollars for 2$\frac{1}{4}$ years is 7 times 13$\frac{1}{2}$ cents or 94$\frac{1}{2}$ cents. The interest of 37 dollars for 60 days would be 37 cents, and for 20 days $\frac{1}{3}$ of 37 cents, or 12$\frac{1}{3}$ cents. The whole interest is 18 dollars and 95$\frac{1}{6}$ cents.

146. They would both together do $\frac{3}{4}$ of the work in 1 day, and it would take them $\frac{1}{3}$ of a day to do the other $\frac{1}{4}$. *Ans.* 1$\frac{1}{3}$ day.

147. $\frac{5}{6}$ would be done in 1 day, and it would take $\frac{1}{5}$ of a day to do the other $\frac{1}{6}$. *Ans.* 1$\frac{1}{5}$ days.

149. They both together consume $\frac{1}{2}$ of a bushel in a week, but the woman alone consumes only $\frac{1}{5}$ of a bushel in a week. That is, they both together consume $\frac{5}{10}$ in a week, but the woman alone only $\frac{2}{10}$, consequently, the man alone would consume $\frac{3}{10}$; and a bushel would last him 3$\frac{1}{3}$ weeks.

152. A and B can build $\frac{1}{8}$ of it in 1 day; A, B, and C, can build $\frac{1}{5}$ of it in 1 day, the difference between $\frac{1}{5}$ and $\frac{1}{8}$, is $\frac{3}{40}$; therefore C can build $\frac{3}{40}$ of it in 1 day; and it would take him $13\frac{1}{3}$ days to build it alone.

164. Find how much they might eat in a day, in order to make it last 1 month, and then it will be easy to find how much they may eat in a day to make it last 11 months.

167. The money is 7 parts of the whole, and the purse one part; consequently the money is $\frac{7}{8}$, and the purse $\frac{1}{8}$ of 16.

170. He gave 1 part for the apple, 2 parts for the orange, and 4 parts for the melon. These make 7 parts. The apple 3 cents, the orange 6 cents, and the melon 12 cents.

175. If to a number half of itself be added, the sum is $\frac{3}{2}$ of that number; hence, subtract $2\frac{1}{2}$ from 100 and the remainder is $\frac{3}{2}$ of the number of geese that he had.

180. This must be reduced to 6ths. 1 half is $\frac{3}{6}$, and $\frac{1}{3}$ is $\frac{2}{6}$, and the number itself is $\frac{6}{6}$. If therefore to the whole number its half and its third be added, the sum will be $\frac{11}{6}$; hence, 77 is $\frac{11}{6}$ of the number.

181. $\frac{1}{2}$ is $\frac{2}{4}$; therefore if to a number $\frac{1}{2}$ and $\frac{1}{4}$ of itself be added, the whole number will be $\frac{7}{4}$; but when 18 more is added to $\frac{7}{4}$, the first number is doubled; that is, the number is $\frac{8}{4}$ of the first number; therefore 18 is $\frac{1}{4}$ of the number.

IMPROVED

SCHOOL BOOKS.

Colburn's First Lessons, or, Intellectual Arithmetic.

THE merits of this little work are so well known, and so highly appreciated in Boston and its vicinity, that any recommendation of it is unnecessary, except to those parents and teachers in the country, to whom it has not been introduced. To such it may be interesting and important to be informed, that the system of which this work gives the elementary principles, is founded on this simple maxim; that, *children should be instructed in every science, just so fast as they can understand it.* In conformity with this principle, the book commences with examples so simple, that they can be perfectly comprehended and performed mentally by children of four or five years of age; having performed these, the scholar will be enabled to answer the more difficult questions which follow. He will find, at every stage of his progress, that what he has already done has perfectly prepared him for what is at present required. This will encourage him to proceed, and will afford him a satisfaction in his study, which can never be enjoyed while performing the merely mechanical operation of ciphering according to artificial rules.

This method entirely supersedes the necessity of any rules, and the book contains none. The scholar learns to reason correctly respecting all combinations of numbers; and if he reasons correctly, he must obtain the desired result. The scholar, who can be made to understand how a sum *should* be done, needs neither book nor instructer to dictate how it *must* be done.

This admirable elementary Arithmetic introduces the scholar at once to that simple, practical system, which accords with the natural operations of the human mind. All that is learned in this way is precisely what will be found essential in transacting the ordinary business of life, and it prepares the way, in the best possible manner, for the more abstruse investigations which belong to maturer age. Children of five or six years of age will be able to make considerable progress in the science of numbers by pursuing this simple method of studying it; and it will uniformly be found that this is one of the most useful and interesting sciences upon which their minds can be occupied. By using this work children may be farther advanced at the age of nine or ten, than they can be at the age of fourteen or fifteen by the common method. Those who have used it, and are regarded as competent judges, have uniformly decided that more can be learned from it in one year, than can be acquired in two years from any other treatise ever published in America. Those who regard economy in time and money, cannot fail of holding a work in high estimation which will afford these important advantages.

Colburn's First Lessons are accompanied with such instructions as to the proper mode of using them, as will relieve parents and teachers from any embarrassment. The sale of the work has been so extensive, that the publishers have been enabled so to reduce its price, that it is, at once, the cheapest and the best Arithmetic in the country.

Colburn's Sequel

THIS work consists of two parts, in the first of which the author has given a great variety of questions, arranged according to the method pursued in the First Lessons; the second part consists of a few questions, with the solution of them, and such copious illustrations of the principles involved in the examples in the first part of the work, that the whole is rendered perfectly intelligible. The two parts are designed to be studied together. The answers to the questions in the first part are given in a Key, which is published separately for the use of instructers. If the scholar find any sum difficult, he must turn to the principles and illustrations, given in the second part, and these will furnish all the assistance that is needed.

The design of this arrangement is to make the scholar understand his subject thoroughly, instead of performing his sums by rule.

The First Lessons contain only examples of numbers so small, that they can be solved without the use of a slate. The Sequel commences with small and simple combinations, and proceeds gradually to the more extensive and varied, and the scholar will rarely have occasion for a principle in arithmetic, which is not fully illustrated in this work.

Colburn's Introduction to Algebra.

Those who are competent to decide on the merits of this work, consider it equal, at least, to either of the others composed by the same author.

The publishers cannot desire that it should have a higher commendation. The science of Algebra is so much simplified, that children may proceed with ease and advantage to the study of it, as soon as they have finished the preceding treatises on arithmetic. The same method is pursued in this as in the author's other works; every thing is made plain as he proceeds with his subject.

The uses which are performed by this science, give it a high claim to more general attention. Few of the more abstract mathematical investigations can be conducted without it; and a great proportion of those, for which arithmetic is used, would be performed with much greater facility and accuracy by an algebraic process.

The study of Algebra is singularly adapted to discipline the mind, and give it direct and simple modes of reasoning, and it is universally regarded as one of the most pleasing studies in which the mind can be engaged.

The Author's Preface.

The first object of the author of the following treatise has been to make the transition from arithmetic to algebra as gradual as possible. The book, therefore, commences with practical questions in simple equations, such as the learner might readily solve without the aid of algebra. This requires the explanation of only the signs plus and minus, the mode of expressing multiplication and division, and the sign of equality; together with the use of a letter to express the unknown quantity. These may be understood by any one who has a tolerable knowledge of arithmetic. All of them, except the use of the letter, have been explained in arithmetic. To reduce such an equation, requires only the application of the ordinary rules of arithmetic; and these are applied so simply, that scarcely any one can mistake them, if left entirely to himself. One or two questions are solved first with little explanation in order to give the learner an idea of what is wanted, and he is then left to solve several by himself.

The most simple combinations are given first, then those which are more difficult. The learner is expected to derive most of his knowledge by solving the examples himself; therefore care has been taken to make the explanations as few and as brief as is consistent with giving an idea of what is required.

In order to study this work to advantage, the learner should solve every question in course, and do it *algebraically*. If he finds a question which he can solve as easily without the aid of algebra as with it, he may be assured, this is what the author expected. If he first solves a question, which involves no difficulty, he will understand perfectly what he is about, and he will thereby be enabled to encounter those, which are difficult.

When the learner is directed to turn back and do in a new way, something he has done before, let him not fail to do it, for it will be necessary to his future progress; and it will be much better to trace the new principle in what he has done before than to have a new example for it.

The author has heard it objected to his arithmetics by some, that they are too easy. Perhaps the same objection will be made to this treatise on algebra. But in both cases, if they *are* too easy, it is the fault of the subject, and not of the book. For in the First Lessons, there is no explanation; and in the Sequel there is probably less than in any other books, which explain at all. As easy however as they are, the author believes that whoever undertakes to teach them, will find the intellects of his scholars more exercised in studying them, than in studying the most difficult treatise he can put into their hands.

$x + 2x + 3x = 60$

$6x = 60$

$x = 10$

20

30

$\frac{8}{4}$ $\frac{12}{4}$

4

4

14